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JOURNAL OF ORAL SURGERY, ANESTHESIA AND HOSPITAL DENTAL SERVICE

Fred A. Henny, D.D.S., Editor

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Use of heterogenous bone in oral surgery

■ *William H. Bell,* D.D.S., Houston, Texas*

The practicality of the bone bank today is an established fact as is evidenced by the many recent publications[1-11] on the successful operation of both homologous and heterogenous bone banks. The chief difficulty in the operation of a homogenous bone bank is the procurement of the necessary amount and quality of bone needed. The advantages of the heterogenous bone bank may be listed as follows:

1. Unlimited availability.
2. Easy storage and transportation.
3. Selectivity of whatever type of bone (cancellous or cortical) needed for the procedure at hand.
4. Freedom from the possibility of syphilis or hepatitis virus contamination.
5. No legal question involved in obtaining bone.
6. Operating time and trauma reduced by not having to make additional incisions to obtain autogenous bone.
7. Selectivity of desired length and form of graft to be used.

Inferior clinical results with the transplantation of homogenous or heterogenous bone are probably due to an actively acquired immunity, the foreign protein in the graft acting as an antigen to produce circulating antibodies. Although a number of reports of experimental studies[12-15] have suggested that this is so, the specific antibodies have not been found.

Because the introduction of any foreign protein of antigenic capacity into the human body will theoretically precipitate an antigen-antibody reaction, the heterogenous bone graft should be considered in this same light. Basic scientists and clinicians have tried for many years to alter the antigenic response of heterogenous bone by physical or chemical treatment. This paper will describe the clinical results obtained with two heterogenous bone substitutes, "anorganic" and "despeciated calf bone."

■ *History of Heterogenous Bone Grafting*

Probably the first reported successful heterogenous bone graft was performed by van Meekeren[16] in 1668. The operation consisted of transplanting an implant from a dog's skull to a skull defect of a Russian soldier. Ollier[17] in 1885 reported

on the clinical results obtained with the use of 60 heterogenous bone grafts. The majority of these grafts were failures. Papers by Schmitt[18] in 1893, Barth[19] in 1895, Axhausen[20] in 1909, Baschkirzew and Petrow[21] in 1912, Calvé[22] in 1935, and Orell[23] in 1937, reported results with heterogenous bone grafting which were not uniformly good. During this period there also appeared in the literature many reports on the successful use of ivory, cowhorn and beef bone screws and plates for the treatment of fractures.[24-26] As recently as 1943 Hughes[27] reported on the rate of absorption and callus-stimulating properties of cowhorn, ivory, beef bone and autogenous bone. From his study he concluded that there was no firm union between ivory or cowhorn pegs and the host bone, and that beef bone was a much better substitute for autogenous bone grafts than ivory or cowhorn was.

Orell in 1934[28] was one of the first to study the problem of preservation of heterogenous bone for transplantation. He employed a physiochemical process for removing the fat and connective tissue from bone and called the resultant product os purum. This investigation stimulated many other attempts by clinicians and chemists to alter the heterogenous bone graft by physical storage or chemical treatment. In 1937 Orell[23] modified his treatment of heterogenous bone by placing it beneath the periosteum of the tibia. It was retained there for a time and was transplanted at a later date to the desired location. Orell called this bone transplant os novum. In 1937 he reported the successful use of os novum in 50 cases.

In 1949, Judet, Judet and Arviset[29] published their clinical results with calf bone refrigerated at low temperatures. These results were comparable with other clinical reports on human bone.

In 1953, Guilleminet, Stagnara and Perret[30] published their experiences with 80 heterogenous bone grafts. They concluded that in general their results were comparable with those obtained with autogenous grafts if the host bed was healthy and vascular and the graft well immobilized. In 1954, Kleinberg[2] reported his results with the use of frozen calf bone. He felt that calf bone was a good substitute for autogenous bone and that the two differed only in their rate of incorporation. Freidel[11] in 1956, reported that refrigerated heterografts were very satisfactory as support and filler grafts but that autogenous bone should be employed where there is complete lack of bone structure.

Heterogenous bone has been used by Beube[31] in periodontics for over 20 years. Cross[32, 33] and Forsberg[34] have published papers recently describing their use of heterogenous bone in periodontics. No positive conclusions could be drawn from any of these studies because of short term roentgenographic follow-ups and lack of controls.

Tucker[35, 36] has reported successful grafting with stored bovine bone and has theorized that clinical successes are due to prolonged storage in 20 per cent homologous bovine plasma at 40°F. Because the species specificity is supposedly decreased or lost when bone is "cultured" in this manner, this bone has been termed "despeciated calf bone."

Losee and Peckham[37] have attempted to alter the heterogenic properties of calf bone by treating it with an organic solvent ethylene diamine. The unchanged inor-

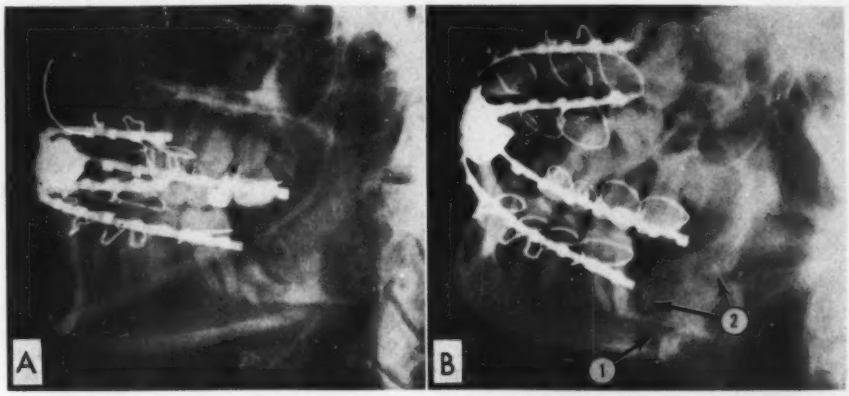


Fig. 1—Case 1. A: Lateral oblique view taken April 30, 1957 showing original fracture treated unsuccessfully by Roger Anderson pin fixation. B: Lateral oblique view taken July 5 showing (1) loss of bone in fracture site and (2) sequestra present in line of fracture and vertical ramus

ganic matrix has been termed "anorganic bone." Boyne and Losee[38] have found histological evidence of "biologic host acceptance of cross-species anorganic bone in mandibular and maxillary osseous defects of the oral cavity."

■ *Method and Materials*

Because of Losee's experimental results with anorganic bone and the reported clinical successes with cultured calf bone,[9,35,39,40] a clinical trial with these two bone substitutes was undertaken. This paper will give the results obtained with the use of these two bone substitutes in 20 patients. Each of these patients, with one exception, had a defect in the form of a bony cavity resulting from either the enucleation of a cyst or the removal of a benign tumor. Six of these were filled with anorganic bone. Thirteen others were filled with despeciated calf bone paste. (Throughout this article despeciated calf bone paste refers to cancellous calf bone which has been stored in bovine plasma at 40°F. for a minimum of 30 days and ground to 15 to 20 mesh.) A portion of a fetal calf mandible was used in one case to replace the resected body of a mandible. The clinical results obtained in 11 of these cases are reported to demonstrate the manner in which these two bone substitutes are accepted by the human host.

■ *Case 1*

A 43 year old Negro woman was seen on July 5, 1957 with the chief complaint of pain, swelling and drainage from the right side of the body of the mandible. In April she had been treated unsuccessfully by Roger Anderson external pin fixation for a fractured mandible (Fig. 1, A).

EXAMINATION—On the left side of her face there was a draining sinus tract. Roentgenographic examination revealed a loss of bone in the molar region and presence of sequestra in the fracture site and the vertical ramus (Fig. 1, B). There was superior displacement of the proximal

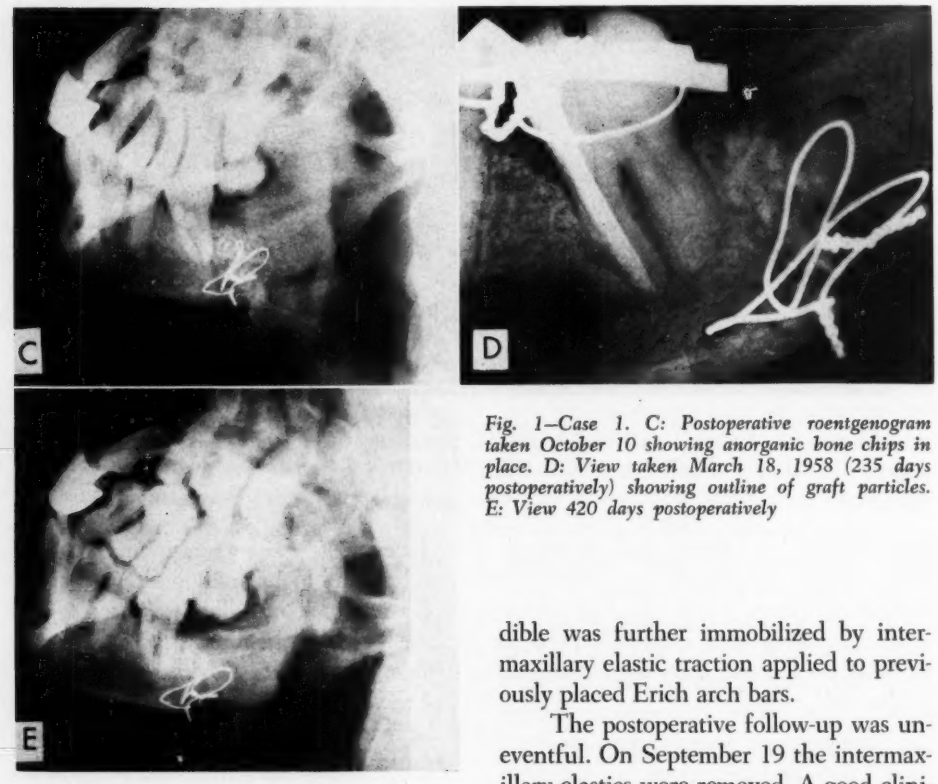


Fig. 1—Case 1. C: Postoperative roentgenogram taken October 10 showing anorganic bone chips in place. D: View taken March 18, 1958 (235 days postoperatively) showing outline of graft particles. E: View 420 days postoperatively

fragment. A diagnosis of osteomyelitis and nonunion of the mandible was made.

TREATMENT—On July 25, with the patient under general endotracheal anesthesia, the sinus tract was excised. By means of a Risdon approach, the sequestra were removed from the vertical ramus and the fracture site. The fibrous tissue interposed between the bone fragments was excised and anorganic cortical bone chips (U. S. Standard Mesh 10-20) were placed in the buccal region where there was loss of from 2 to 3 mm. of bone. Transosseous wires were placed for reduction and immobilization of the fragments. The mandible was further immobilized by intermaxillary elastic traction applied to previously placed Erich arch bars.

The postoperative follow-up was uneventful. On September 19 the intermaxillary elastics were removed. A good clinical union was noted (Fig. 1, C-E).

COMMENT—Although the results of this case were very satisfactory, there are two significant findings to be considered. First, because there was not complete loss of bone continuity on the lingual, the host bone could exert its own osteogenetic effect on the filling-in of the defect. Second, the anorganic particles were very slow to be resorbed. This is well illustrated by the roentgenograms made 14 months postoperatively.

■ *Case 2*

A 52 year old white man was first seen on October 14, 1957, with the chief

complaint of pain in the maxillary central incisor region of two years' duration.

EXAMINATION—Roentgenographic examination revealed a large cystic area at the apex of the upper left lateral incisor extending to, but not perforating, the floor of the nose. A tentative diagnosis of radicular cyst was made.

TREATMENT—On October 24, with the patient under local anesthesia, the anterior teeth were extracted and the cyst was enucleated from the maxilla (Fig. 2, A). The lesion was removed without exposure of the floor of the nose. The bony defect was filled with anorganic cancellous bone chips (U. S. Standard Mesh 5-10) (Fig. 2, B and C).

Healing of the mucoperiosteal flaps was by primary intention, and the postoperative follow-up was uneventful until November 19. The patient complained of intermittent swelling in the upper lip and floor of the nose regions. He was seen periodically during the next seven months and complained each time of intermittent swelling and drainage in the operated area. When seen on May 20, 1958, there was a draining sinus tract on the labial of

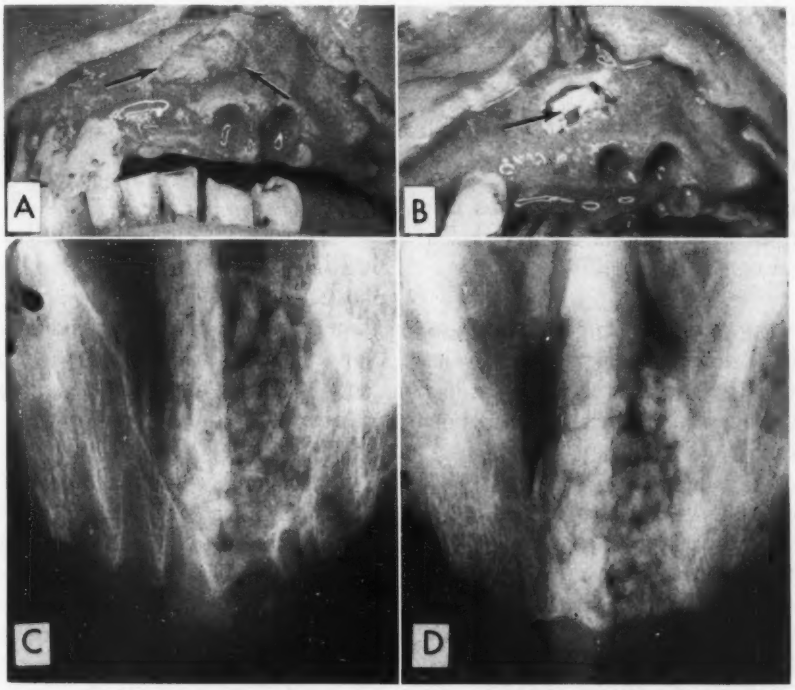


Fig. 2—Case 2. Teeth extracted, mucoperiosteal flap reflected and thinned labial cortical plate removed exposing cystic lining. B: Anorganic bone particles placed loosely into bony defect. C: Immediate postoperative view, October 29, 1957, showing outline of radicular cyst and anorganic bone particles. D: Occlusal view, May 19, 1958, showing anorganic bone particles present after 200 days

the alveolar ridge opposite the upper left lateral incisor extraction socket. The bony defect was explored and the anorganic particles removed from the cavity. It was then packed with gauze, and the decompression was maintained by periodic irrigations. The postoperative follow-up thereafter was uneventful.

COMMENT—Figure 2, C and D, reveals that the only roentgenographic change after 200 days was on the periphery where there was partial filling-in of the defect. There was minimal consolidation of the bone particles and no detectable resorption of them. These findings were verified clinically when the bone chips were removed. Some of the particles on the periphery had become incorporated in host connective tissue, but the majority were lying dormant.

■ *Case 3*

A 64 year old Negro man was first seen in October 1957 for treatment of a radicular cyst of the maxilla.

EXAMINATION—Roentgenographic examination showed a large cyst to be present at the apex of the maxillary left second bicuspid. Intraoral examination was negative.

TREATMENT—On October 11, with the patient under local anesthesia, the upper left quadrant of teeth were extracted. A mucoperiosteal flap was reflected to gain access to the molar region. A cyst approximately 3.5 cm. in diameter was enucleated and the bony cavity filled with anorganic cancellous bone chips (U. S. Standard Mesh 10-20).

The postoperative follow-up was uneventful until January 8, 1958. The patient stated that particles had been extruding into his mouth for three weeks. When examined again on August 7, the operative site had completely healed over. The majority of the bone particles had sloughed out. A few had become incorporated into the clot on the periphery of the cavity, and these were clearly visible in the roentgenogram.

This case was treated at the oral surgery section of the dental service at the Veterans Administration Hospital, Houston, Texas.

■ *Case 4*

The patient, a 40 year old white man, was seen in March 1956 for diagnosis and treatment of an extensive radiolucent area that could be seen in the left horizontal and vertical rami of the mandible (Fig. 3, A).

EXAMINATION—Histological study of the biopsy specimen showed the tumor to be a myxoma. Roentgenographic study showed the tumor to extend from the lower left second bicuspid posteriorly to and including a portion of the vertical ramus.

TREATMENT—Under local anesthesia, the lower first and second molars were extracted, the tumor curetted out and the bony cavity filled with despeciated calf bone paste. The operation was performed by Dr. Morris B. Murphy. A water-tight closure of the mucoperiosteal flaps was not obtained. Postoperatively there was extrusion of approximately one fourth of the bone paste. Within three weeks epitheliza-

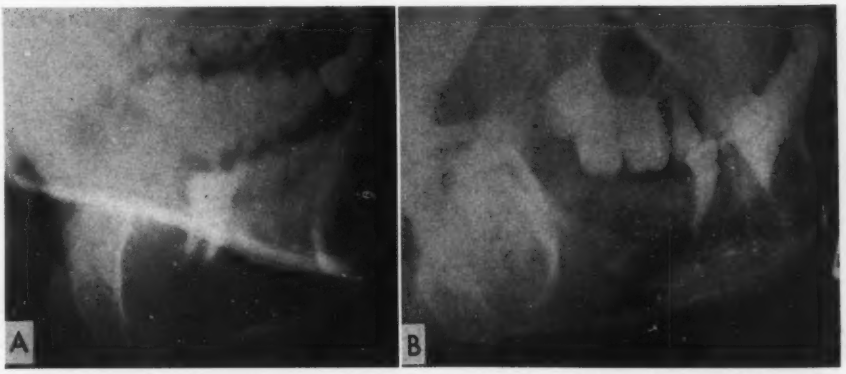


Fig. 3—Case 4. A: Preoperative lateral oblique view, March 1956, showing extensive myxoma. B: Roentgenographic appearance five months after tumor was enucleated and defect filled with despeciated calf bone paste

tion took place across the surgical defect. From there on the clinical progress was satisfactory.

COMMENT—The calf bone for this patient was the most despeciated calf bone used in any one case. However, because of the relatively short-term roentgenographic follow-up (five months) (Fig. 3, B) this case loses some of its significance. From the clinical standpoint it is considered fairly successful. Because the patient has not been seen since August 18, 1958, it is assumed that his progress continues to be satisfactory.

■ *Case 5*

A 63 year old white man was first seen on May 28, 1956 for treatment of a nasopalatine cyst (Fig. 4, A).

TREATMENT—On June 1, under local anesthesia, the cyst was enucleated and the resulting cavity filled with despeciated calf bone paste (Fig. 4, B). There was a marked depression of the crest of the alveolar ridge in the region of the cyst. An attempt was made to restore the normal height to the alveolar ridge in this depressed region by use of the bone paste. The postoperative progress was satisfactory.

COMMENT—Roentgenographic examination two years after implantation (Fig. 4, C) of the bone paste showed that the cystic defect had not completely filled in with normal trabeculated bone. It was also noted that the depression in the alveolar crest was still present. These bone chips had been resorbed but not replaced by new host bone.

This case was treated at the oral surgery section of the dental service, Veterans Administration Hospital, Houston, Texas.

■ *Case 6*

A 25 year old white woman was first seen in June 1956 for diagnosis and treatment of a radiolucent area (Fig. 5, A) located in the symphysis region of the man-

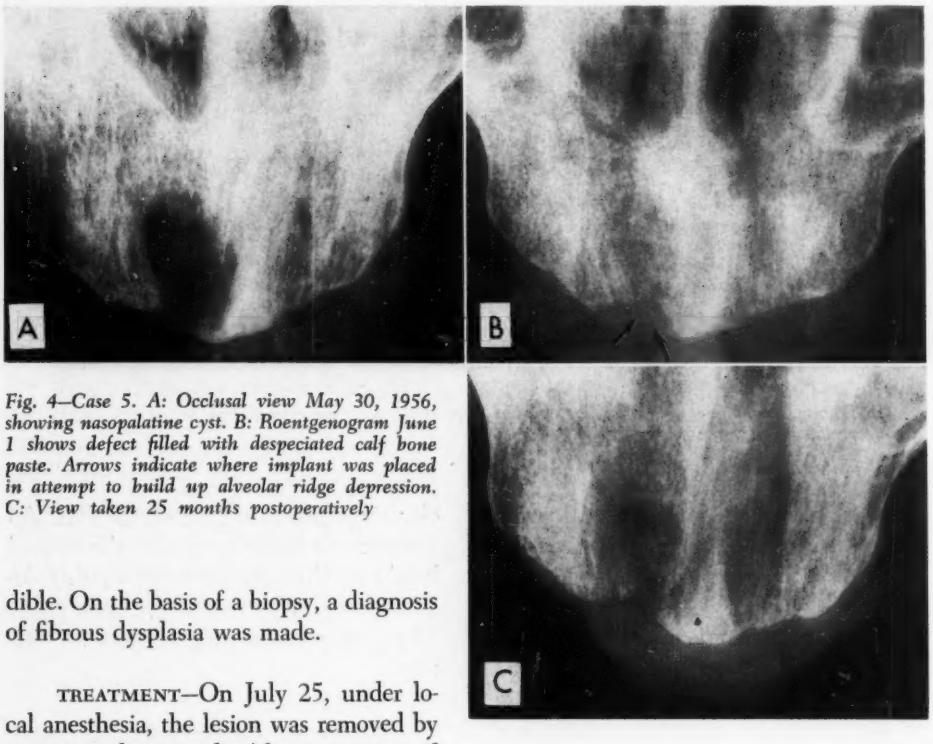


Fig. 4—Case 5. A: Occlusal view May 30, 1956, showing nasopalatine cyst. B: Roentgenogram June 1 shows defect filled with despeciated calf bone paste. Arrows indicate where implant was placed in attempt to build up alveolar ridge depression. C: View taken 25 months postoperatively

dible. On the basis of a biopsy, a diagnosis of fibrous dysplasia was made.

TREATMENT—On July 25, under local anesthesia, the lesion was removed by an intraoral approach. After extraction of the lower anterior teeth and the first bicuspids, the lesion was curetted out and the bony cavity filled with despeciated calf bone paste (Fig. 5, B). The operation was performed by Drs. Edward C. Hinds and Raymond E. Fonville.

The patient's postoperative progress was uneventful.

COMMENT—This is one of the best results obtained with the use of despeciated calf bone paste. Although periodic roentgenograms (Fig. 5, A-D) revealed slow resorption of the implant, they suggested that eventually the bone particles were resorbed and replaced by normal trabeculated bone (Fig. 5, D).

■ *Case 7*

A 55 year old white man was seen on January 10, 1956 for treatment of a radicular cyst of the right side of the body of the mandible (Fig. 6, A).

TREATMENT—On April 10, under local anesthesia, the cyst was enucleated and the defect filled with despeciated calf bone paste (Fig. 6, B). When the patient was seen again on April 24, the incision line was open and there had been extrusion of some of the bone particles. Within two weeks this void had become filled with granulation tissue and epithelization had taken place over the surface.

Fig. 5—Case 6. A: Preoperative view June 25, 1956, showing involvement of symphysis and left mental regions with fibrous dysplasia

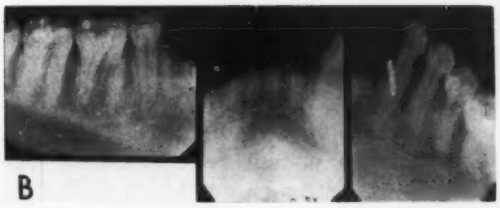


Fig. 5—Case 6. B: Postoperative view November 19 showing despeciated calf bone paste after 155 days

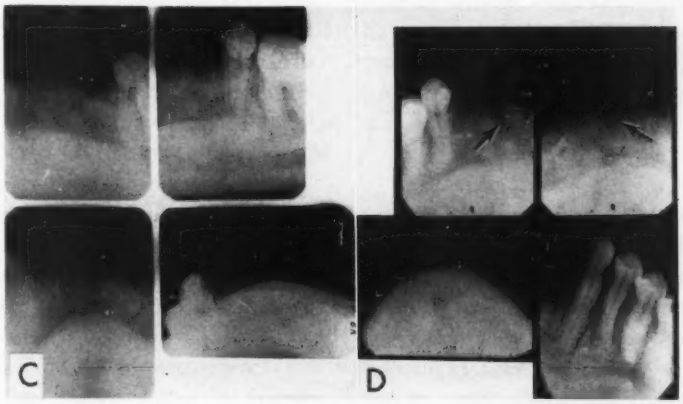


Fig. 5—Case 6. C: Appearance after 255 days. D: View 20 months postoperatively shows normal trabeculated bone

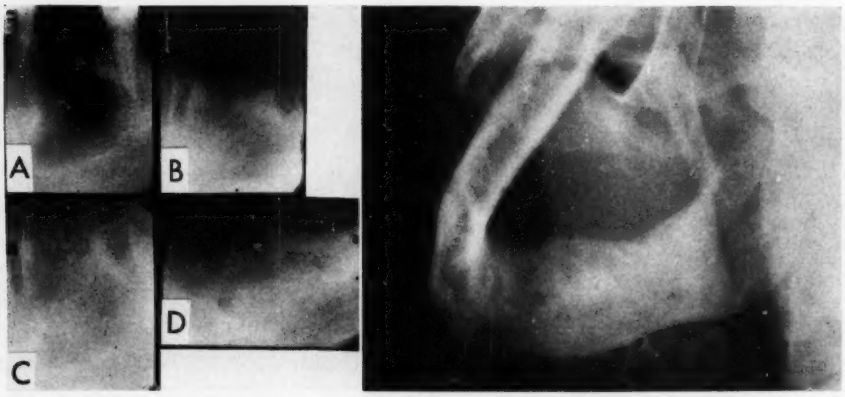


Fig. 6—Case 7. Left: A, preoperative view April 10 showing radicular cyst. B, postoperative view April 24 showing bone paste in place. C, view 10 months postoperatively. D, view after 27 months. Right: Roentgenographic appearance after 27 months

COMMENT—When the operation was performed initially a water-tight closure of the mucoperiosteal flaps was not obtained. For this reason partial extrusion of the implant was not unexpected. A roentgenographic follow-up over a period of 27 months revealed that the bone particles were slow to be resorbed and that they had not yet been replaced with normal trabeculated bone.

■ *Case 8*

A 42 year old white man was seen on April 24, 1956 for diagnosis and treatment of an infected radicular cyst of the maxilla.

TREATMENT—On April 24, 1956, under local anesthesia, a Partsch operation was performed. Decompression was maintained by periodic irrigations. On August 14, 1956, under local anesthesia, the remainder of the cyst (about 3 cm. in diameter) was enucleated and the bony cavity filled with despeciated calf bone paste.

COMMENT—For two weeks bone particles sloughed out of the operative site. Eventually drainage ceased and epithelium grew over this area. When seen on July 2, 1958, he was asymptomatic. Roentgenographic follow-up suggested that practically all the implant had been extruded.

■ *Case 9*

A 6 year old white girl was admitted to the hospital on February 5, 1957 for treatment of an ameloblastoma of the vertical ramus of the mandible. The tumor had been treated in March 1956 by subtotal curettage.

TREATMENT—Under general endotracheal anesthesia, the lesion (about 3 cm. in diameter) was curetted out by an intraoral approach. The cavity was filled with despeciated calf bone paste.

COMMENT—In spite of a water-tight closure of the mucoperiosteal flaps and good initial healing, the patient ran a low

grade fever until February 11. On this date, sloughing of some of the bone paste commenced and persisted for about ten days. At least two thirds of the implant was lost during this time. When seen on March 15, there was complete healing of the operative site. Roentgenographic study of July 18, 1958 revealed no evidence of recurrent disease and filling-in of the defect with normal trabeculated bone. The bone paste was of no value in this case and undoubtedly contributed to her protracted course of healing.

■ *Case 10*

On November 6, 1956 a 38 year old Negro woman was first seen, with the chief complaint of pain and swelling in the left side of the body of the mandible after trauma to the face.

EXAMINATION—Lateral oblique roentgenograms revealed a fracture of the right side of the body of the mandible extending obliquely through a radicular cyst. There also was a fracture through the left side of the body of the mandible in the edentulous second molar region.

TREATMENT—On November 8 Erich arch bars were placed on the remaining teeth. The fracture of the left side of the body was treated by transosseous circumferential wiring of the fragments. The fracture through the right side of the body was exposed by an intraoral exposure. A radicular cyst about 1.5 cm. in diameter was enucleated, and the defect was filled with despeciated calf bone paste. Bone paste also was placed between the fracture fragments.

The postoperative follow-up was uneventful. On December 25 the intermaxillary elastic traction was discontinued and a good clinical union of the fragments was noted.

Roentgenographic examination on January 10, 1957 showed only moderate resorption of bone at the adjacent fracture lines. There was no roentgenographic evidence of bony union. When the patient was seen again on August 22, her condition was satisfactory; however, she would not consent to have more roentgenograms taken.

COMMENT—Very little can be concluded from this case because of the relatively short roentgenographic follow-up. Healing time of mandibular fractures is variable, and frequently follow-up roentgenograms must be taken for six months to one year before complete bony union is seen.

■ *Case 11*

A white man age 46 was seen in June 1957 with the chief complaint of swelling over the midpoint of the right side of the body of the mandible. On January 2, 1957, he had been treated for squamous cell carcinoma of the lower lip with metastasis to the submental region by radical neck dissection.

EXAMINATION—On July 8 an aspiration biopsy was performed on the submental mass. Histological examination of the biopsy was positive for squamous cell carcinoma. Roentgenographic studies of the mandible did not show bone involvement. On July 31 right radical neck dissection and hemimandibular resection in continuity were performed. The resulting

surgical defect was bridged with a fetal calf bone graft which was wired into place with stainless steel wires and immobilized with an intramedullary Kirschner wire (Fig. 7, A). The patient died on November 25 of recurrent disease.

FOLLOW-UP—An autopsy was obtained and an en bloc section was removed from the anterior junction between the mandible and the fetal calf bone graft (Fig. 7, C). Histologic study verified the clinical and roentgenographic impression of fibrous union. There were only minimal amounts of new bone formation and this was seen mainly in the area adjacent to host bone (Fig. 7, E). Interposed between the host bone and the fetal calf bone graft was fibrous connective tissue.

This case was treated by Dr. Herbert H. Harris and the otolaryngology department of the Veterans Administration Hospital, Houston, Texas.

■ *Discussion*

The average length of roentgenographic follow-up in this study was 14 months. No patient was included in this series unless followed for a minimum of six months. The average clinical follow-up was slightly longer because two patients would not consent to have long-term follow-up roentgenograms taken. According to the author's subjective evaluation of the roentgenographic and clinical findings, the results were categorized as either good, fair or unsatisfactory.

The results of anorganic bone grafts were good in 2 instances, fair in 1 and unsatisfactory in 3.

The results in despeciated calf bone grafts were good in 4 instances, fair in 6 and unsatisfactory in 4.

The time that it takes for a bony cavity to become filled with new host bone is indirectly proportional to the size of the defect. Because the main source of osteogenesis in a bony cavity arises from the endosteal elements of the host walls, even though it be filled with autogenous bone chips, a small defect will fill in with new bone quicker than a large defect. Because the bony cavities treated in this series of cases varied considerably in size, type and location, the statistics must be considered with some reservations. It should be noted that better results were obtained where calf bone paste or anorganic bone was placed into smaller defects. In these cases the osteogenic potential of the host bone is so great that healing may take place in spite of the bone substitute used to fill the defect and not necessarily because of the property of the implant to induce new bone formation.

It might be argued that intraoral bone grafts are not feasible procedures. It has been shown, however, when antibiotics are used with discretion, that autogenous[41] and homogenous[42-44] bone chip grafts can be used successfully to fill large cystic defects of the mandible.

Tucker[35] has advocated using despeciated calf bone paste for maintaining the height of the alveolar ridge after alveolectomy procedures. The results of Case 5 and other similar cases[45] suggest that this bone is not effective when used for this purpose. When bovine bone chips are placed in a bony cavity, they are eventually resorbed and replaced by new bone which grows in from the walls of the cavity. However, when they are placed above the alveolar ridge, they are subsequently resorbed but not replaced by new bone.

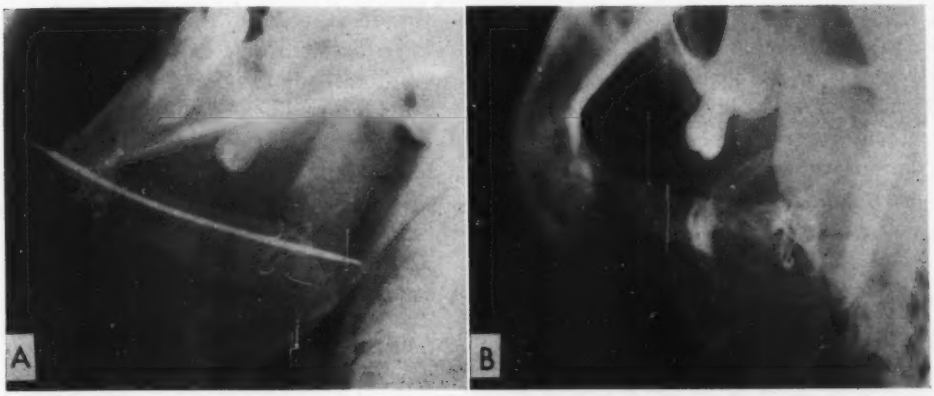


Fig. 7—Case 11. A: Postoperative lateral oblique view taken August 12, 1957, showing fetal calf bone graft in place. B: View of graft at autopsy showing resorption at anterior junction

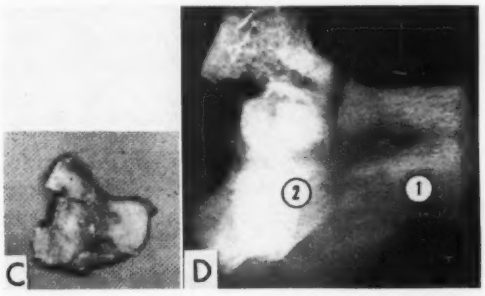
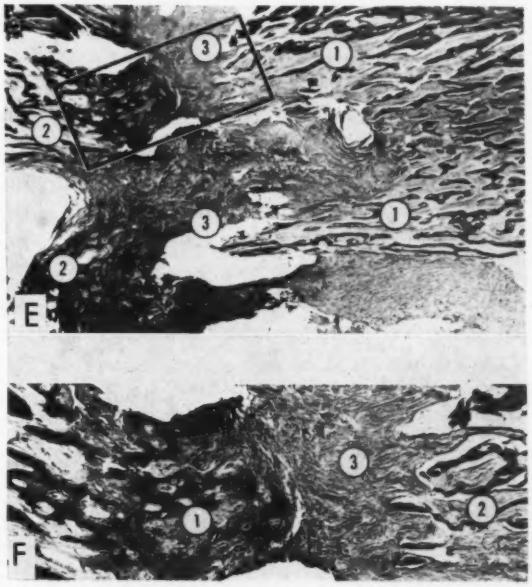


Fig. 7—Case 11. C: Gross appearance of resected specimen. D: View showing junction between (1) fetal calf bone graft and (2) host bone

Fig. 7—Case 11. E: Low power photomicrograph showing (1) fetal calf bone graft separated from (2) host bone by (3) mostly fibrous connective tissue. F: Medium power photomicrograph from designated area in view E shows (1) new bone being laid down along host bone. This is separated from (2) bovine bone graft by (3) fibrous connective tissue



Cases 1 and 2 illustrate how slowly anorganic bone is resorbed by the host. Despeciated calf bone paste was somewhat harder to evaluate roentgenographically because after it is placed into a cavity it appears very homogeneous in the roentgenogram. Resorption of the bone paste was also very slow. These findings corroborate the author's previously published histologic study[45] of heterogenous bone implants in humans.

The ideal bone graft is one which is (1) accepted with little or no reaction (2) rapidly revascularized (3) undergoes at least surface resorption and (4) replaced by new host osseous tissue. The author's clinical and experimental experience with both of these heterogenous bone substitutes leads him to believe that neither fulfills the above criteria in the manner that autogenous cancellous bone does.

The fundamental question of what induces[46] the host bone forming cells to grow into the bone graft still must be solved. Ultimately this solution may come from the biochemist or histochemist. This inductor substance may be found in the organic fraction of the bone transplant. Moss[47] has recently succeeded in extracting an organic factor from despeciated calf bone which acts as an osteogenic inductor when placed intracerebrally in rats.

The importance of calcium salts in bone grafts has probably been overstressed. Beube[31] has suggested that boiled calf bone be used in periodontal disease because it acts as a local calcium source. Linghorne and O'Connell[48,49] consider that the stimulus for differentiation of osteoblasts depends on the calcium salts of the bone graft. Although they are essential for mechanical reasons where large gaps in the continuity of the mandible are to be restored, they are not essential for grafts to bony cavities where strength is not a factor. There is evidence to suggest that calcium salts may even act as deterrents to the ingrowth of host connective tissue.[50] Mandarino[51] has shown that new host bone will grow into polyurethane when this plastic material is used as a substitute for bone grafts.

As early as 1889, Senn[52] recommended the use of antiseptic decalcified bone chips for treatment of aseptic bony cavities. He said that this guards against the unnecessary loss of blood and exerts a potent influence in the prevention of infection by pus microbes that might have remained on the surface of the wound or in the tissues.

Ghormley and Stuck[53] in 1934 wrote:

> We are convinced that the process of reducing the calcium content of the bone may hasten its union in a transplanted position. This may be due, again, to the fact that a decalcified graft is more readily permeable by this matrix, but we feel that an added stimulus is brought about by the chemical change of decalcification.

Although this report contains the results of only one fetal calf bone mandible (Case 11) the author is of the opinion that the case represented a good test for this type of graft because of the excellent immobilization obtained against good vascular and healthy host bone. Whether or not this graft eventually would have been resorbed and replaced by new host bone can only be speculated. If there was eventual replacement by new host bone this substitution would be very slow, possibly over a period of years. It did, however, act as a satisfactory and functional replacement for four months. Roentgenographi-

cally and histologically the graft was being resorbed (Fig. 7, B and D), but there was minimal replacement by new bone. On the other hand, there had been initial resorption of the host bone but this was followed by osseous invasion of new bone-forming tissues.

There is a limited amount of experimental and clinical evidence[54,55] that there is probably reduced antigenicity of fetal or newborn tissues. May[56] has coined the term "brephoplastic transplantation" to apply to situations when the donor is fetal or newborn. There is need for more experimental work in this comparatively new field, to determine whether there is a reduction in the antigenicity response of these transplantations.

■ *Summary and Conclusions*

A review of the significant history of heterogenous bone grafting has been made and the theoretical implications discussed. Although the 20 cases reported in this paper do not constitute a large series, the results to date with anorganic and despeciated calf bone have not been uniformly good. A high percentage of poor results has been obtained where these bone substitutes were used to treat large bony defects. Where they were used to treat smaller bony defects, filling in with new bone may have been slower than if the cavities had been allowed to fill with only a blood clot.

Autogenous cancellous bone from the ileum is the ideal bone for transplantation to the mandible and maxilla, when the surgical procedure warrants its use. Its use is particularly warranted where bony gaps in the continuity of the mandible are to be restored.

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*Assistant professor, department of surgery, The University of Texas Dental Branch.

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■ The Brink of the Unknown

Perhaps a future generation, which knows the outcome of our present efforts, will look at them with some irony. They will see where we fumbled and they will work more consistently towards the target it indicates. So it will always be, but let us hope that they will not find any reason to criticize us because of a lack of that combination of steadfastness of purpose and flexibility of approach which alone can guarantee that the possibilities which we are exploring will have been tested to the full. Working at the edge of the development of human society is to work on the brink of the unknown. Much of what is done will one day prove to have been of little avail. That is no excuse for the failure to act in accordance with our best understanding, in recognition of its limits but with faith in the ultimate result of the creative evolution in which it is our privilege to cooperate.—*Dag Hammarskjold, Context 1:18 Spring 1961.*

Methohexital sodium: a clinical appraisal in oral surgery

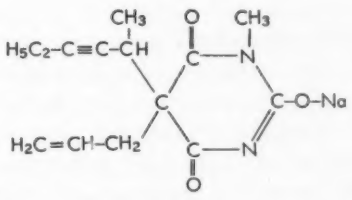
■ *Leonard Z. Lyon, D.D.S., Beverly Hills, Calif.*

In oral surgery, as in other branches of medicine and dentistry, there is a never-ending search for the "perfect anesthetic." Many new local anesthetics have been introduced in the past ten years that have shown considerable improvement over procaine. Also, in the field of general anesthesia, many barbiturates intended for intravenous anesthesia have been synthesized and tested clinically. Included among these agents are thiopental sodium, 1934, thiamylal sodium, 1948, and methitural sodium, 1954. The newest agent to be described is methohexital sodium.

It has been stated, "The paramount objectives of general anesthesia for ambulatory patients are safety, patient acceptance, and control of recovery time."[1] Methohexital sodium appears to meet these challenges more nearly than other barbiturates intended for use as intravenous anesthetic agents.

The precursor of methohexital sodium was synthesized in 1954 and was first used clinically the latter part of 1955. The original low-melting-point isomer was subsequently modified to yield a material of higher melting point which became identified as methohexital sodium.

Methohexital sodium is sodium *α-dl*-1-methyl-5-allyl-5-(1-methyl-2-pentynyl) barbiturate. The structural formula is as follows:



Although methohexital sodium differs from other intravenous anesthetics in several aspects, its chief point of difference is that it contains no sulfur. In comparison to thiopental sodium or thiamylal sodium, the sulfur atom is replaced by an oxygen atom. In common with other sodium salt barbiturates, the pH of methohexital sodium is approximately 11.

The substitution of an oxygen atom and other subtle changes in structure impart certain distinctive features to metho-

hexital sodium. These comprise (1) greater milligram per milligram potency (two to five times, depending on species), (2) shorter duration of effect (clinically about one-half as long as other widely-known barbiturates intended for use as intravenous anesthetic agents), and (3) prompt recovery, even after prolonged anesthesia.[2]

The greater milligram per milligram potency of methohexital sodium makes it desirable that the agent be administered as a 1.0 per cent solution rather than the usual 2 to 2.5 per cent solutions utilized with the thiobarbiturates. Rate of administration is somewhat slower than with the older agents, as will be described.

The basic pharmacologic properties of methohexital sodium observed in animal studies exist in essentially comparable degree in human subjects. Induction is rapid and smooth. The resulting anesthesia is profound and adequate for oral surgical procedures. Recovery is prompt and virtually without untoward sequelae. Clinically, methohexital sodium appears to be approximately 2.7 times more potent than the popular thiobarbiturates on a milligram per milligram basis. Significantly, in spite of its increased potency, recovery time is shortened to a considerable degree. It appears that the more rapid and complete metabolism of the molecule provides for the accelerated recovery.

■ *Procedure*

Prior to the administration of any anesthetic, it is important to obtain a medical background of the patient. The history elicited should include questions regarding previous evidence of or therapy for cardiac disease, hypertension, anemia, tuberculosis, kidney or liver disease, diabetes, or rheumatic fever. Careful interrogation is essential regarding possible sensitivity or allergy to drugs.

Similarly, the patient is questioned regarding medications that he may be taking at the present time with particular emphasis concerning use of steroids, tranquilizers and antihypertensive drugs. Evidence of serious organic illness warrants referral to a physician for necessary corrective measures or an opinion concerning the wisdom of proceeding with contemplated surgery at this time. The blood pressure of every patient is taken and recorded. Simultaneously, the rate and character of the pulse are observed.

Elective cases are requested to abstain from food and drink for a minimum of four hours preceding anesthesia. However, in emergency situations it may be necessary to waive these directives. In cases of this type added caution must be exercised to avoid aspiration of vomitus should emesis occur. Fortunately, with this anesthetic agent, there appears to be minimal incidence of nausea or vomiting.

■ *Premedication*

I consider that premedication has its place with the use of methohexital sodium as it has with other similar general anesthetic agents, whether they comprise intravenous barbiturates or inhalants. Premedication, however, must be based on the individual requirements of the patient. Considerations include age, height, weight, medical history, degree of apprehension, physical status, habits of life, the anticipated length of the surgery and the difficulty of the procedure. Numerous

drugs are used for premedication. The average dosage is as follows: atropine, 0.4 mg. (1/150 grain) and meperidine hydrochloride, 15 to 25 mg., administered intravenously. Depending on individual requirements, it may be necessary to repeat the meperidine hydrochloride.

In my opinion assurances to the patient concerning the anesthetic and surgical procedures to be employed are almost as important as the selection of the drugs to be used prior to and for the surgery contemplated. Such assurances should be given at the time of examination and may advantageously be repeated up to the time of the administration of the anesthetic agent.

Hubbell and Krogh[1] do not recommend premedication for ambulatory oral surgery patients except in rare instances or for very nervous patients. These authors found that the dosage of thiopental sodium as reported in their study[1] could be decreased by premedication, but recovery time was prolonged because of the relatively slow metabolism of hypnotic-analgesic used, for example, pentobarbital sodium and morphine.

Tranquility and receptiveness of the patient at the time of surgery is important. Relaxation and lack of apprehension in ambulatory patients at the time of surgery can also be enhanced by the judicious use of selected medication administered several hours prior to the surgical appointment. It is, of course, important to recognize that the maximal effect of the premedicant has worn off and is in a waning phase of activity when the patient is seen under these circumstances. Nevertheless, for a patient who has previously been evaluated medically and who is to be operated on early in the morning, a night of unbroken rest is highly beneficial. In cases of this kind the author prescribes secobarbital sodium (Seconal Sodium), 100 mg. (1½ grain), or promethazine hydrochloride (Phenergan), 25 mg., or both, to be taken the night before the surgery. If the patient arrives in the office well rested, calm and relaxed, no other premedication may be necessary. However, if the patient is still agitated, the administration of additional oral premedication may be indicated.

Occasionally, a situation may exist where there would be insufficient time for oral medication to be effective. In these instances premedication administered intravenously immediately prior to the anesthetic procedure may be considered. The author's choice of premedication at this time, where the contemplated procedure will continue for 15 to 30 minutes, consists of atropine, 0.4 mg., and meperidine hydrochloride, 15 to 25 mg., administered intravenously, about five minutes prior to induction.

Occasionally, when indicated by patient apprehension or drug tolerance, secobarbital sodium, 100 mg. (1½ grains) is given orally about 1 to 1½ hours preoperatively. For longer procedures promethazine hydrochloride, 25 mg., may also be used, but the use of this medication may tend to potentiate the action of the barbiturate.

Inasmuch as it is my purpose to administer a smooth anesthetic to a relaxed patient and to have the patient ambulatory as soon as possible postoperatively, preoperative medications must be administered in minimal amounts to achieve the desired tranquility. However, since the

action of premedicants such as secobarbital sodium and pentobarbital sodium outlasts that of methohexital sodium, the former agents are employed sparingly to prevent postanesthetic stupor. In essence, every effort is directed to achieving relaxation without depression either before, during or after anesthesia.

For extremely short procedures such as the extraction of one or two teeth, in which the anticipated surgical procedure is simple and only of several minutes' duration, premedication may not be necessary. This, however, must be evaluated entirely by the patient's stress reaction.

A modified "surge technic"[1] with no premedication may be used. For longer procedures it may be desirable to modify the intermittent surge technic in the administration of the methohexital sodium. Immediately upon loss of consciousness, or concomitantly with induction, the barbiturate is supplemented with a mixture of nitrous oxide-oxygen in a ratio of not less than 25 per cent oxygen. For pregnant patients, persons with cardiac or hypertensive problems, and relatively poor anesthetic risks, it is my custom to increase the oxygen flow to 100 per cent. Cardiac patients are often given 100 per cent oxygen for several minutes prior to venipuncture in order to protect the individual against any possibilities of hypoxic effects.

■ *Induction Time*

It is of utmost importance that the induction period be smooth and free of adverse responses. Speed of induction is secondary to smoothness and freedom from side effects. In the author's experience minimal intermittent increments of methohexital sodium (20 to 30 mg.) are adequate for a smooth induction if preceded by 15 to 30 mg. of meperidine hydrochloride. With this technic a brief period of waiting is suggested to permit all agents to exert their maximal effect. Signs of anesthesia occur after the initial injection, in the usual arm-to-brain circulation time. This will average about 12 seconds in normal subjects.[3,4] The surgeon in his anxiety may wish to begin surgery as soon as possible and in so doing not permit adequate time for the anesthetic agent to reach the brain and produce the effect of "chemanesia."[5] "Chemanesia" is a coined word to denote the state of amnesia produced by a chemical agent or drug. Monheim considers that this term aptly describes the second stage of anesthesia. When a patient has achieved the state of "chemanesia," he retains no memory but may, nevertheless, exhibit basic reflexes. Many operative procedures in the field of dentistry can be satisfactorily performed with the depth of anesthesia no further advanced than the state of "chemanesia."

■ *Methods of Administration*

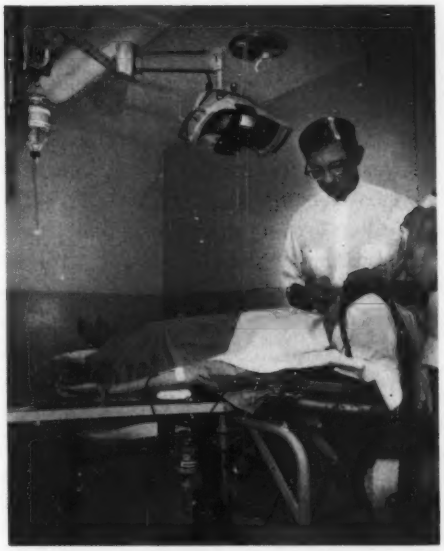
Because of the greater potency of methohexital sodium, induction is slower than with the use of the barbiturates. This method was adopted when experience indicated that rapid injection of methohexital sodium occasionally produces hiccups, or a transient apnea. As a guide, a rate of 1 cc. of a 1.0 per cent (10 mg.) solution in five seconds may be used initially. The total induction dosage usually ranges between 20 to 50 mg. but must be individualized for each patient. The lumen of the needle is kept patent with continuous intravenous drip of 5 per cent glucose in water. A 21 gauge, 1½ inch needle

suffices. In patients with diabetes, the glucose drip is omitted.

■ *Technic*

A test dose of approximately 2 cc. of 1.0 per cent (20 mg.) methohexital sodium is given at the time of venipuncture. The intravenous tube is connected to an intravenous drip of 5 per cent glucose in water, which is infused rapidly for 15 seconds (see illustration). For operative procedures expected to continue in excess of five minutes, the test dose is followed by a mixture of atropine, 0.4 mg., plus 15 to 25 mg. meperidine hydrochloride. Approximately 30 seconds then are allowed to observe the patient's reaction. When the patient becomes drowsy, a nasal mask providing a flow of nitrous oxide, 75 per cent, and oxygen, 25 per cent, is applied. Intermittent increments of methohexital sodium (20 to 40 mg.) are then administered as needed. The induction dosage usually maintains anesthesia with the supplementation of nitrous oxide-oxygen for an average of five to seven minutes. For short procedures that may be completed before the supplemental effect of nitrous oxide is established, methohexital sodium alone may be used.

It has been my experience that with the use of premedication and the cautious administration of methohexital sodium, induction complications, namely, apnea, hiccups, or muscular jactitations, have been negligible in incidence or severity. Although laryngospasm is stated to occur less frequently than with other intravenous barbiturates, the practitioner must be on the alert because this complication may occasionally develop. Laryngospasm after use of any barbiturate is treated by the administration of oxygen, prompt and careful aspiration of throat secretions and administration of a skeletal muscle relaxant such as succinylcholine. If pulmonary ventilation is depressed, it must be artificially maintained until spontaneous respiration is resumed.



Complete apparatus. Suspended solution is 5 per cent dextrose in water. Bottle below arm board is 1 per cent methohexital sodium solution

■ *Maintenance Dosage*

The lightest level of anesthesia consistent with patient safety and the surgeon's requirements is maintained with intermittent injections of 20 to 50 mg. increments of methohexital sodium. Increments are usually administered immediately prior to times of greatest stimulation during the surgical procedure.

For operations of five to ten minutes' duration, supplementary injections of methohexital sodium are not often re-

quired if the initial level of anesthesia has been adequate.

With the exception of very short procedures, those completed in less than five minutes, all patients are maintained on nitrous oxide-oxygen inhalation, in a ratio ranging from 50:50 to 75:25.

In resistive patients or in the occasionally encountered large, powerful or apprehensive individual, it may be necessary to augment the meperidine hydrochloride premedication component rather than "pushing" the methohexital sodium. A local nerve block often is used for some anticipated lengthy or difficult procedure to reduce the total volume of anesthetic agent that otherwise might be required and also for its hemostatic effect.

■ *Recovery After Anesthesia*

As already indicated, it seems apparent that methohexital sodium does not accumulate in the tissues to the extent observed with the thiobarbiturates. The response to verbal or tactile stimulation is almost immediate, or within a few minutes after termination of the anesthetic procedure. The patient having undergone a brief surgical procedure, does not exhibit the tendency to lapse back into sleep, a condition so very commonly observed with the thiobarbiturates.

■ *Results*

The present series comprised a total of 513 patients, of whom 319 were female and 194 were male. Age of the subjects ranged from 6 to 75 years, with the average age being 33.9 years. Weight of the lightest patient was 40 pounds; weight of the heaviest patient was 250 pounds.

Dosage extremes for the series ranged from 20 to 500 mg. methohexital sodium (Brevital Sodium). Average dosage for the series was 127.05 mg. Anesthesia time for the entire series ranged from 1 to 60 minutes; the average time was 15.08 minutes. Response time after termination of the anesthetic procedure ranged from immediate to 14 minutes, with the average 85.9 seconds. Response time implies recovery to a degree where patient responds to his name and is able to answer simple questions.

Procedures comprised normal and surgical extraction of single and multiple teeth, cystectomy, exposure of unerupted teeth, removal of impacted teeth, and the usual procedures that the oral surgeon is called on to perform. Dosage required in a given case was usually directly proportional to length and severity of the procedure.

Adverse effects were not troublesome nor a matter for concern. Excursions in systolic and diastolic blood pressures were well within the limits observed with thiobarbiturate anesthesia. The single exception occurred in a 70 year old woman where blood pressure was 200 over 96 at the beginning of the procedure, and 160 over 90 at termination of surgery. The negligible drop in the diastolic reading indicated the fall in systolic pressure from 200 to 160 to be of no serious significance.

Virtually all patients in the series exhibited what was considered essentially normal behavior throughout the procedure including induction, maintenance and recovery. Seven instances of hiccups and five of jactitations at induction readily responded to small increments of methohexital sodium.

Partial laryngospasm was observed

in four patients. In three, mild transitory respiratory depression was easily corrected by introduction of 100 per cent oxygen for a brief period. Two patients experienced cough during induction.

Side effects during the postanesthetic and recovery periods were insignificant with reference to incidence and severity. In general the phenomena observed were essentially compatible with those noted after intravenous thiobarbiturate anesthesia for oral surgery procedures.

■ *Conclusion*

Methohexital sodium in keeping with the thiobarbiturates exhibits the interesting property of producing amnesia in extremely light planes of anesthesia. It is the "amnesic" plane, rather than the surgical plane of anesthesia which is most frequently utilized for dental surgery.[6]

Patients recovering from methohexital sodium anesthesia are rapidly oriented, experience a sense of well-being, and attain mental clarity far more promptly than is observed after other intravenous barbiturate anesthesia. Frequently, patients do not remember that they have been asleep nor do they entirely comprehend that the surgical procedure has been completed. Because methohexital sodium contains no sulfur radical, patients do not complain of unpleasant taste or odor. The incidence of postoperative nausea or vomiting has been negligible in this series. Postanesthetic depression or "hangover" has virtually been absent. The clinical experiences observed with methohexital sodium in the present study prompt the opinion that this drug should be considered a distinct addition to the intravenous barbiturate anesthetic agents for the ambulatory oral surgery patient.—9735 *Wilshire Boulevard.*

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■ Uniformity

When there's always uniformity of opinion, you'll find that part of the crowd isn't thinking.—*Anonymous.*

Bilateral benign hypertrophy of masseter muscle

■ *M.S.N. Ginwalla,* L.D.Sc. (Bombay), D.D.S., M.Sc., Bombay, India*

Benign hypertrophy of the masseter muscle, either unilateral or bilateral, is an established surgical entity. The patient usually seeks advice because of asymmetry of the face or has been referred to the oral surgeon for diagnosis and treatment. These hypertrophies have been mistakenly diagnosed as hamartoma, fibrolipoma, lymphangioma, hemangioma, osteoma and benign or malignant parotid tumors.

The real deformity is caused by increase in bulk of the muscle with a decided downward accentuation of the mandibular angle. The face has a squarish appearance as the muscles stand out on both sides which makes the ears appear to adhere closely to the head (Fig. 1).

These enlargements at the angles are nontender, ill-defined, soft on palpation and nonfluctuant. The overlying skin is loose and not tense, can be moved freely, and does not adhere to the underlying muscle. When the patient is re-

Fig. 1—Preoperative views demonstrating bilateral swellings over mandibular rami. Note fullness and accentuation of mandibular angle

quested to contract his masseter muscle forcibly, it does not necessarily cause any appreciable change in the "flabbiness" of the muscles.

The etiology of benign hypertrophy of the masseter muscle has not been established definitely but several theories have been advanced. It may be acquired or congenital. The acquired form may be caused by hyperfunction of the masseter muscles, by keeping the muscle tense, the teeth clenched, and by habitual grinding of the teeth in sleep.

In unilateral hypertrophy there may be missing teeth on the opposite side and the patient habitually chews on the hypertrophied side. There also may be malocclusion and secondary wearing down of the cusps caused by habitual chewing of hard substances. These pernicious habits also bring about derangements of the temporomandibular joint on the affected side. Trauma has no bearing on the development of the hypertrophy. Usually the causative factor is hyperfunction of the masseter muscle.

The acquired type has been known to increase in size gradually. Spontaneous remissions have been known, but growth recurs at an increased rate. Both sexes are equally affected. The age incidence is between the second and fourth decades of life.

The correct diagnosis of these swellings is important. The growth should be established to be within the masseter muscle. Stensen's duct may be deflected laterally on sialography. Lateral roentgenograms would demonstrate exostosis or a spinelike bony prominence of the angle of the mandible. Differential diagnosis is made easily between tumors of bone and

Fig. 2—Preoperative roentgenogram demonstrating masseter muscle

muscle with the aid of roentgenograms (Fig. 2).

The only treatment is surgical resection of the hypertrophied muscle as well as any abnormal bone spurs or spine at the angle of the mandible.

■ *Technic*

An incision about an inch and a half long is made in the submandibular region, beginning around the angle of the mandible and extending up to the anterior border of the masseter muscle. The parotid fascia is exposed and divided at the free border of the mandible. The lower portion of the parotid gland is retracted upward to expose the masseter muscle. The buccal and mandibular branches of the facial nerve are searched for, identified, dissected free and retracted out of the field (Fig. 3). The whole of the masseter muscle is freed from the inferior border of the mandible and is stripped from the ascending ramus about half way.

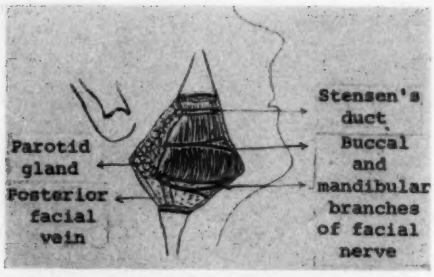

Fig. 3—Anatomic relations at surgery

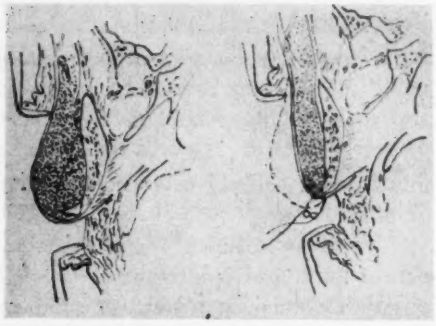

Fig. 4—Resection of muscle on its medial aspect, before and after operation

With the masseter muscle retracted, the resection of the hypertrophied muscle is carried out on its medial aspect and the muscle reduced to its normal thickness (Fig. 4). Once this is done, the periosteum is reflected and the bony spurs and the accentuated angle and bony spine at the free border are trimmed by sharp chisels and bone nibbling forceps. The muscle is replaced and sutured to the internal pterygoid muscle fibers and the adjoining fascia over the free border of the mandible. The parotid fascia is fixed back in its position and after a few subcutaneous sutures of no. 000 chromic catgut, the wound is closed with no. 0000 Dermalon sutures, leaving a small finger drain at the angle to be removed after 48 hours. A similar procedure is carried out on the other side, restoring normal facial contour (Fig. 5).

The patient is placed on an antibiotic regimen for four days. Active jaw movement is encouraged after the fourth day of operation. The patient experiences

Fig. 5—Postoperative views showing improved facial harmony and return to normal contour at mandibular angle

no difficulty and does not complain of loss of tone of the masseter muscle when closing the jaw.

One particular aspect that we noted in our patient was that on reflecting the masseter muscle, the exposed angle revealed a hollowed-out depression or concavity and the bone in that region was decidedly thinned out. This was observed on both sides of the mandible. We have tried but been unable to find a mention of this peculiarity in literature on this subject.

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*Head, department of maxillofacial and plastic surgery, Nair Hospital Dental College, Bombay 8, India.

■ Aid to Clear Thought

The vital aid to clear thought is the habit of approaching everything we hear and everything we are taught to believe with a certain skepticism. The method of using doubt as an examiner is a familiar one among scholars and scientists, but it is also the best protection which a citizen has against the cant and humbug that surround us.—*Alan Simpson. The Marks of an Educated Man. Context 1:5 Spring 1961.*

Stress patterns in dental patients: I. Serum free 17-hydroxycorticosteroids, sodium and potassium in subjects undergoing local anesthesia and simple exodontic procedures

■ *Ira L. Shannon,* D.M.D., M.S.D.; John R. Prigmore,† Ph.D.; Warren R. Hester,‡ D.D.S.; Clarence M. McCall, Jr.,§ D.D.S., M.S., and Gerald M. Isbell,‖ D.D.S., Brooks Air Force Base, Texas*

In a carefully controlled study, the response of the adrenal cortical mechanism was observed in dental patients who were undergoing procedures in oral surgery. The anticipation of the surgical procedure proves to be a significant stimulus to raise the level of plasma steroids. The administration of local anesthesia alone did not produce a significant response. No significant changes were seen in serum sodium and potassium levels.

Evaluation of patient response to dental operations has seldom been completely objective. Pain, swelling, trismus, and other symptoms exemplify commonly employed criteria. Unavoidable variations in interpretation by both patients and investigators make the results of such studies subject to considerable question. It was the purpose of these studies to search for responses of the human adrenal cortex to dental procedures in an effort to provide objective measurements of patient reaction. Answers were sought to the following:

1. Does the administration of local anesthetic agents in the oral region produce detectable cortical response? If so, is there a difference in response to commonly employed anesthetic agents? Is the site of injection of significance in this regard?

2. Is a simple extraction procedure predictably associated with cortical stimulation?

3. Is the psychic insult of anticipating an appointment for exodontia detectable in blood adrenocortical steroid levels?

■ *Material and Methods*

One hundred and fourteen male subjects between 17 and 22 years of age participated. Each had been proved physically fit for military service by recent

medical examination. Control and experimental subjects were so paired that food and drink, time of arising and retiring, physical exertion and environmental exposure prior to participation were identical. These subjects are directly comparable to those who participated in our previous experiments.[1-4]

CONTROL SUBJECTS—Sixty-one persons in this category received local anesthetic agents only. A 20 ml. blood sample was drawn at 7:30 A.M. and each subject was then injected with either lidocaine hydrochloride (Xylocaine) or propoxycaine hydrochloride (Ravocaine). A second blood specimen was withdrawn three hours after the administration of the anesthetic. Forty-one of the subjects received a simple buccal infiltration anesthetic in the region of the upper left second molar; 20 received lidocaine hydrochloride and 21 were given an injection of propoxycaine hydrochloride. The remaining 20 subjects were anesthetized as for the removal of a lower molar tooth. Maxillary injections were carried out under particularly atraumatic conditions—that is, the patient was given verbal reassurance regarding the operation, an exceedingly sharp needle was used, and the injection was made very slowly. Mandibular anesthesia was administered under routine clinical conditions. In an effort to obviate variations in anticipatory emotions, the subjects were not informed concerning their pending participation; neither were they informed that a second blood sample was to be taken.

EXPERIMENTAL SUBJECTS—For these 53 subjects, a pretreatment blood sample was drawn at 7:30 A.M.; within the next hour, local anesthesia was instituted with lidocaine and an erupted lower molar tooth was removed. The time of first insertion of the anesthetic needle was taken as time zero and a second blood sample was drawn three hours thereafter. In all instances, the experimental subjects had been aware for at least 48 hours that an extraction was to be performed on the particular date.

The serum was separated and analyzed for free 17-hydroxycorticosteroids (17-OHCS), sodium, and potassium. The 17-OHCS method was that of Peterson and co-workers.[5] Serum steroids were extracted into methylene chloride, nonspecific chromogens were removed by sodium hydroxide treatment, and color was developed by the Porter-Silber[6] reaction with a phenylhydrazine-sulfuric acid reagent. Color was read in microcuvets at 410 millimicrons on a Beckman DU spectrophotometer, adapted with a diaphragm attachment for estimations with microcuvets. Serum sodium and potassium were determined on 1:200 and 1:10 dilutions, respectively, of serum in 1 per cent trichloroacetic acid. Standards simulated normal serum components and analyses were performed on a Beckman DU spectrophotometer equipped with a flame attachment.[1]

■ *Results*

LOCAL ANESTHESIA CONTROLS—To determine if the differences between the means at time zero and at three hours for control subjects were significantly different for any of the three variables under test, standard deviations of the

Table 1

Means and standard deviations for the four groups of subjects

Time	17-OHCS (gamma per cent)		Sodium (mEq./liter)		Potassium (mEq./liter)	
	Mean	S. D.	Mean	S. D.	Mean	S. D.
Maxillary Ravocaine (N=21)						
Zero	14.63	3.56	143.8	2.05	4.76	.25
3 hour	14.96	3.10	143.7	2.15	4.75	.28
Maxillary Xylocaine (N=20)						
Zero	14.92	3.17	143.3	1.43	4.68	.27
3 hour	14.44	2.74	142.4	1.64	4.68	.30
Mandibular Xylocaine (N=20)						
Zero	12.38	3.85	143.1	2.08	4.72	.34
3 hour	13.97	3.98	142.9	2.12	4.74	.37
Mandibular exodontia (N=53)						
Zero	18.08	3.55	142.5	3.14	4.71	.40
3 hour	16.28	4.28	142.5	3.02	4.73	.36

mean differences between these samples were calculated for each subject, along with the standard error of the difference between the means. Tests based on these data revealed no significant differences between the time-zero sample and the three-hour sample for either 17-OHCS, sodium, or potassium. Thus, there were neither significant differences due to the type of anesthetic employed nor to the location of the injection and consequent anesthesia (Table 1).

EXPERIMENTAL SUBJECTS—The data for the 61 subjects who received only anesthesia were then pooled as control data and compared with the results found for the 53 subjects who underwent extraction. The resultant mean values are presented in Table 2. There were no differences of significance in sodium and potassium levels between the two groups but the time-zero 17-OHCS mean for the experimental subjects, 18.08 gamma per cent, was significantly ($P<.01$) higher than the 13.88 gamma per cent found for the controls. After three hours the mean for the experimental subjects had dropped to 16.28 gamma per cent, still higher than the time-zero or three-hour mean for any other group studied. It is to be emphasized that every subject in this group had been aware, for at least 48 hours, of the exact date and time of his impending oral surgery. Since this was the only group that had been forewarned and since there was an unquestionably significant difference between this time-zero mean and that for any of the other three experimental groups (Table 1), it appeared that psychic trauma was the activating factor. This significantly high time-zero level was capable of obliterating the effects, if any, of the exodontic procedure.

Table 2 • Means for pooled data from 61 control subjects and 53 exodontia patients

Time	17-OHCS (gamma per cent)	Sodium (mEq./liter)	Potassium (mEq./liter)
Controls			
Zero	13.88	143.4	4.69
3 hour	14.46	143.0	4.72
Experimental			
Zero	18.08	142.5	4.71
3 hour	16.28	142.5	4.73

■ *Discussion*

It is well established that, subsequent to various types of trauma, the human organism responds with alterations in the cortex of the adrenal glands.[7-16] The effect of the cortex on sodium and potassium metabolism is well substantiated. Considerable literature has accumulated concerning the increase in adrenocortical hormones in urine[10,11,17-19] and in blood[13,17,20-22] after surgical procedures. Hydrocortisone represents by far the greatest portion of the steroids in human adrenocortical secretion.[23] Since the analytic method employed in this study is specific, with certain exceptions,[4,24] for the 17, 21-dihydroxy-20-ketosteroid configuration, it measures hydrocortisone and cortisone, as well as other compounds. It does not, however, measure corticosterone, desoxycorticosterone, and related compounds.

The time of sampling is of great importance in studies of blood steroids. It has been pointed out by Steenburg and coworkers[17] that, after surgery, the increase of free 17-OHCS in serum was early, steep, and massive. The response was found to be greater than the maximal ACTH dose response and was on the order of a fourfold increase in four hours. These investigators concluded that measurement of the serum free 17-OHCS provided an index of the timing and intensity of the adrenal response to injury and that the urinary excretion of total steroids gave a better measurement of the total duration and magnitude of the response.

The speed of the change in blood level is also emphasized by Kallio and Tala[7] who found that the free 17-OHCS levels in psychiatric patients undergoing electroshock therapy rose from a control mean of 19.6 gamma per cent to a 15-minute postshock mean of 29.4 gamma per cent. This was 3.8 gamma per cent higher than the mean level for the same group 1¾ hours after shock. Moore[25] reported that blood 17-OHCS levels increased rapidly with surgical trauma, reaching a peak within six hours of incision. Franksson and co-workers[20] found in 27 surgical patients, that all of them presented high blood 17-OHCS immediately after operation, that the level was high for about 38 hours in uncomplicated cases, and that shock brought about very high values. Elman and co-workers[21] reported that in 19 instances of moderate to extensive elective surgery, the serum 17-OHCS peaked 8 to 12 hours after surgery and fell to preoperative levels in 24 to 72 hours.

For an exhaustive review of present knowledge concerning the adrenocortical hormones and the adrenal response in surgical patients, the reader is referred to the monumental work of Bjorn Thomasson[26] whose monograph reviews 363 reports in this field. It also includes his own findings on 194 healthy normal subjects and 233 surgical patients, both before and after operation.

The fact that serum 17-OHCS levels were significantly higher in those patients expecting oral surgery than those not so informed is consistent with other investigations in general surgery. Moncrief and co-workers,[27] working with 14 patients, found the serum corticosteroid levels of apprehensive patients just prior to surgery to be two to three times greater than

24 hours earlier. Franksson and Gemzell[20] corroborate these results in 33 patients, as do Price and others[28] in 24 subjects. It should be pointed out, however, that conflicting results have been obtained in other investigations.[20, 29-32] It seems clear that, in the present study, the emotional impact of anticipating the oral surgical procedure must be incriminated as the traumatic factor. With the high preoperative level, it is impossible to draw conclusions relative to the cortical stimulus associated with the exodontic procedure, except that certainly no major stimulus was involved. Clarification is expected from current studies in which the subjects are not aware that an extraction is to be performed.

The fact that the administration of local anesthetic agents did not produce a significant cortical response is in agreement with findings of Moore,[25] who reported that, in general surgery, local anesthetic agents seemed to exert no effect on the adrenal cortex. With other types of anesthesia he found the following: Ether is a very potent stimulus to the cortex; cyclopropane is a mild stimulus; complete surgical relaxation for periods up to three hours may be obtained with combinations of thiopental sodium, nitrous oxide, and curare or similar drugs without any stimulation of the adrenal cortex whatever; and spinal anesthesia actually inhibits the adrenocortical response.

■ *Summary*

Serum free 17-hydroxycorticosteroids, sodium, and potassium were measured in 114 healthy young adult men undergoing various types of dental operations. Lower molar extractions were carried out on 53 subjects; the remaining participants received local anesthetic agents of different types in varying oral locations. The following conclusions were drawn:

The administration of local anesthetic agents did not produce significant cortical response.

The psychic trauma of anticipating oral surgery proved to be a significant stimulus to the cortex.

A direct effect attributable to tooth removal, *per se,* was not seen. It is possible that sampling time could have been such as to miss a slight fleeting stimulus, but it seems more likely that the high preoperative steroid levels masked the response.

There were no significant differences in serum sodium or potassium under any of the imposed experimental conditions.

The opinions or assertions contained in this article are the private ones of the writer and are not to be construed as official or reflecting the views of the Department of the Air Force or the Air Service at large.

*Major, Dental Corps, U.S. Air Force; department of dental sciences, School of Aviation Medicine, USAF Aerospace Medical Center (ATC).

†Major, Medical Service Corps, U.S. Air Force; department of clinical medicine, School of Aviation Medicine, USAF Aerospace Medical Center (ATC).

‡Lieutenant Colonel, Dental Corps, U.S. Air Force; department of dental sciences, School of Aviation Medicine, USAF Aerospace Medical Center (ATC).

§Major, Dental Corps, U.S. Air Force; department of dental sciences, School of Aviation Medicine, USAF Aerospace Medical Center (ATC).

‖Captain, Dental Corps, U.S. Air Force; department of dental sciences, School of Aviation Medicine, USAF Aerospace Medical Center (ATC).

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■ Scientists

We have seen how the Victorian ideas of certainty and causality in science have been replaced by uncertainty and indeterminism. Ideas have been born which bear no relation to everyday experience, but which are now an accepted part of the concept of science. The senses prove to be a poor guide to reality. As physical science has made this revolutionary change in its concepts, it has, strangely enough, become far more powerful in its approach to all problems which face it. Nevertheless, the lesson has been learnt and the smug certainty of the past has gone. The boundless wonder of the physical world fills the man of science with humility, but drives him to discover more and more about it. He no longer expects to find a final answer to any question. His hope is that he may be able to formulate better and better approximations to a description of reality. *Sir Marcus Oliphant, A Scientist Looks at Nature, The Medical Journal of Australia, September 5, 1959.*

Facts and fallacies regarding general anesthesia in dental offices

■ *Frank M. McCarthy,* M.D., D.D.S., M.S., Los Angeles*

Members of the dental profession introduced general anesthesia to the world over 100 years ago, and since that time have been responsible for numerous significant contributions to the field. At present general anesthesia is utilized almost exclusively in many oral surgery offices throughout the United States, and there is increasing interest in the use of general anesthesia for operative dentistry. Obviously, dentistry's concern with general anesthesia has been established by heritage, by utilization, and by patient need.

Several misunderstandings regarding the use of general anesthesia in dental offices will be reviewed. These misunderstandings exist to some degree in both the dental and the medical professions. The remarks will refer primarily to general anesthesia for oral surgery.

■ *Need For General Anesthesia*

General anesthesia is utilized to obliterate pain and consciousness. Although local anesthesia may be employed effectively for the obliteration of pain in nearly all oral surgical and general surgical proceedings, nevertheless patient preference has forced the almost universal use of general anesthesia in general surgery, and patient preference is rapidly forcing the almost universal use of general anesthesia in oral surgery. Although it is true that oral surgery can be performed more rapidly under general anesthesia, with less trauma to the patient, with less postoperative discomfort, and with more convenience to the surgeon, nevertheless I feel that these benefits are secondary and that patient preference plays the most important role in the selection of anesthesia.

The patient's fear of minor oral surgery is remarkable. How many patients say that they would prefer having a baby to having a simple extraction. I make no attempt to force local anesthesia on a patient for other than health reasons, and as a consequence local anesthesia is employed in my office for less than 2 per cent of my patients requiring oral surgery. In addition, if a patient requests local anesthesia and I feel that the planned surgery may be more difficult than the patient anticipates, I suggest general anesthesia for this reason. Some detractors of the use of general anesthesia in an office claim that we are "selling oblivion." On the contrary, I believe we are providing a needed

service to the public. Personally, if I were the patient, I would no sooner have local anesthesia for multiple extractions or impactions than I would have local anesthesia for an appendectomy. The present status of anesthesiology is so advanced that I see no reason why emotional stress should not receive consideration if safe means are available for its prevention.

■ *Mortality Rate*

Certain uninformed criticism has been directed toward the safety record of general anesthetics administered in offices. In actuality, even a casual inspection of the literature reveals that the safety record of general anesthesia in oral surgery offices is without parallel. In 1957 Seldin[1] reported an over-all general anesthesia death rate of 1:66,289 in a total of 3,712,178 oral surgery proceedings performed in both offices and hospitals. Of the 56 deaths under general anesthesia, 42 occurred in hospitals, 13 occurred in offices, and one occurred in a patient's home. Beecher and Todd,[2] in a comprehensive national study in 1954, reported an over-all primary and contributory anesthesia death rate of 1:1,560 in 599,548 hospital surgical cases studied, whereas Hingson and co-workers[3] in 1956 reported a primary anesthesia death rate of 1:3,318 at the University Hospital, Cleveland; general surgery—1:3,007, obstetrics—1:7,131, intrathoracic surgery—1:295. Mannix[4] in 1960 reported an anesthesia death rate of 1:1,500 in 56,000 hospital patients from 1947 through 1952. After making improvements in technics, standard procedures, and personnel, the death rate dropped to 1:9,460 between 1953 and 1959, a highly commendable record.

I should like to stress the fact that a comparison of death rates after general anesthesia administered in oral surgery offices with general anesthesia death rates in hospitals is not done with the intention of placing medical anesthesiology in a poor light. It is unfair to compare such statistics without stressing the basic differences between the two. These differences account for the great variation between office general anesthesia mortality and hospital general anesthesia mortality, a ratio which I place conservatively at 1:20. For example, office oral surgery procedures requiring anesthetics are purely elective and are performed on favorable risk patients, anesthetic duration is comparatively short, the surgery is relatively minor for the most part and rarely can become a threat to life, the surgery can be terminated rapidly if necessary, and operative delays are rare. All of these points of difference add greater hazards that are unavoidable to operations performed under general anesthesia in hospitals.

Before terminating the discussion regarding the safety of office anesthesia, it should be stated that hospitalization does not guarantee the patient any greater chance of survival than if the same procedure is performed in an office. This statement naturally assumes that the oral surgeon is a competent anesthetist. In my own practice, when I feel that the patient is a poor candidate for general anesthesia, I utilize local anesthesia, usually with other agents to control the patient's apprehension. If such a poor risk patient insists on hospitalization, I do not allow general anesthesia to be utilized in the hospital. My primary responsibility is the health and well being of the patient, and

I do not feel that I am discharging my obligations properly by subjecting the patient to a hospital procedure which I feel is unsafe in my office. Needless to say, medical anesthesiologists agree wholeheartedly with this reasoning. The subjection of a poor risk oral surgery patient to general anesthesia in the hospital is a disservice to both patient and anesthesiologist. Such a patient can almost always be handled properly under local anesthesia in the hospital, usually with adjunctive drugs to control apprehension.

■ *Morbidity Rate*

General anesthesia as practiced for oral surgery should not be taken lightly. As so aptly stated by Mannix,[4] there may be some minor surgery, but there is no minor anesthesia. Morbidity or illness after the administration of a general anesthetic is not uncommon. Symptoms consist mainly of nausea, with or without vomiting, lassitude, malaise, and physical and mental depression. Postanesthetic illness is related directly to the same factors which influence the mortality rate and which have already been enumerated. For the same reasons, morbidity after a general anesthetic administered in an office is much less than that after general anesthesia in a hospital. Also, in my opinion the morbidity is decreased still further because preanesthetic medication is utilized to a lesser extent in office general anesthesia than it is in hospital general anesthesia. Premedication with narcotics and long-acting barbiturates plays a substantial role in the production of postanesthetic illness. In current medical literature it is interesting to note that Beecher[5] prefers to avoid narcotics for preanesthetic medication, and Wallace[6] recently introduced a preanesthetic medication regime which does not utilize narcotics. Lastly, cardiac resuscitation in the oral surgery office has been mentioned as being more of a hazard than resuscitation in a hospital. The closed-chest cardiac massage technic of Kouwenhoven and co-workers[7] answers this objection. Their use of this method on 20 patients resulted in an overall permanent survival rate of 70 per cent without central nervous system damage. Using the open-chest cardiac massage technic on 42 patients who suffered cardiac arrest, Turk and Glenn[8] reported complete recovery in 16.7 per cent, cardiac function alone restored in 38.1 per cent and complete failure in 45.2 per cent.

■ *Training*

It has been stated that the general anesthesia training of oral surgeons is inadequate. This criticism may well be true in some instances for although considerable progress in anesthesia training has been made during the past several years, some oral surgery training programs offer only one year of total clinical experience which obviously is inadequate. In the typical one-year program, the oral surgery intern is exposed to 2 to 3 months of clinical anesthesia training conducted on patients requiring only the most minor surgery. Not only is his total clinical experience in anesthesia inadequate both in quantity and in quality of cases, but there is usually little or no laryngoscopy and endotracheal experience. There is rarely any basic science review as it applies to anesthesiology. Such programs produce inadequately trained men.

Royer and Lundy[9] have published an

excellent anesthesia training outline for the dentist. They recommend 6 to 12 months of full-time clinical anesthesia training, concomitant basic science studies, and the administration of general anesthesia to a minimum of 1,000 patients under supervision. At the University of Southern California anesthesiology teaching section, Los Angeles County Hospital, we have attempted to follow the Royer-Lundy recommendations during the past four years for the oral surgery trainees. During the first year of the three-year oral surgery training program, the trainees are introduced to inhalation anesthesia via the open-drop technic utilized only for the most minor surgery. During the second and third years, they spend a total of six months full-time in hospital clinical anesthesia training. They have virtual anesthesiology resident status and responsibilities, and they obtain considerable varied experience with laryngoscopy and endotracheal technics. That phase is supervised entirely by the hospital anesthesiology department, whose wholehearted cooperation and assistance have been invaluable. Also during the second and third years, the oral surgery residents are trained in specific outpatient general anesthesia technics. Every attempt is made to duplicate the typical oral surgery office experience. Each resident spends 312 hours in the outpatient clinical anesthesia department which is entirely under the control and supervision of the division of oral surgery. During this phase of anesthesia training the residents administer general anesthesia to from 500 to 600 outpatients under supervision of the senior attending oral surgeon on the anesthesiology teaching staff. Basic science review continues during the entire three-year program, both on a formal and informal basis.

■ *Conclusions*

1. Dentistry's interest in general anesthesia has been established by heritage, by utilization, and by patient need.

2. The mortality rate for patients under general anesthesia administered in the oral surgery office is conservatively placed at 1/20 of the mortality rate for hospital general anesthesia. However, a comparison of death rates is improper without stressing basic differences between the two.

3. The incidence of morbidity after general anesthesia administered in an oral surgery office is less than that after general anesthesia in a hospital.

4. The closed-chest technic of cardiac massage appears to be superior to the open-chest technic.

5. Training of dentists in general anesthesia has improved, but there is still considerable need for improvement in certain areas.—8930 *Sepulveda Boulevard.*

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*Special lecturer, anesthesiology, University of Southern California School of Dentistry; special lecturer, anesthesiology, School of Dentistry, Loma Linda University; course director, postgraduate division, University of Southern California School of Dentistry; director, U.S.C. anesthesiology teaching section, oral surgery division, Los Angeles County Hospital.

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The team approach to the combined operation for carcinoma of the mouth

■ *Milton L. Sorock, M.D., M.S. (in Surgery), Detroit*

At Memorial Hospital in New York City, resection of a primary lesion within the mouth, including a portion of the mandible, combined with a radical neck dissection, was being performed regularly in 1942, the year of the Allied commando raids on Dieppe. For want of a better designation, the house staff then began to refer to this type of operation as a "commando" and this term has persisted in the literature. This operation is also loosely referred to as the "combined operation." The development of the complexities and the extension of the operative procedure mean it has ceased to be performed by any one individual. A team consisting of the general dentist, oral surgeon, general surgeon capable of head and neck surgery, internist, radiologist and anesthesiologist has been utilized. Each is indispensable in the total management of these patients and the role of each merges with the role of his fellow practitioner.

Whether a patient with mouth cancer will live or die often depends on the alertness of the dentist. Early diagnosis is the greatest single factor in bringing cancer under control. The educational programs of both private and federal agencies have been focused on promoting early diagnosis and are of primary importance. Studies have shown that delay in diagnosis results not only through ignorance and procrastination on the part of the patient but also through failure on the part of the first physician or the first dentist who saw the patient to make a correct diagnosis. The percentage of potential "cures" through surgery and irradiation is higher in the mouth, lip and skin than elsewhere in the body. These are sites that the physician and particularly the dentist can observe readily in everyday practice. Probably 80 per cent of the deaths caused by cancer of the mouth could be averted by early diagnosis and treatment. This statement is based on the well-known observation that carcinoma of the mouth rarely extends below the clavicle in its progression and hence is often resectable with modern surgical methods. Patients die of local invasion rather than distant metastases. In the patients with intraoral carcinoma that I have seen, it is difficult to recall the few who have had metastatic nodules in the preoperative chest roentgenograms. Nonresectability in certain instances usually is due to local invasion and

extension rather than to distant metastasis. Post-mortem examination of most therapeutic failures confirm this observation.

■ *Two Phases of Problem*

The problem of cancer of the mouth may be divided into two phases. The first phase begins with the onset of the growth and extends up to the time when the diagnosis is made and the patient referred for definitive treatment. The second phase begins after the diagnosis has been established and concerns itself with treatment, its proper application, and its systematic follow-up. In most observations and discussions of cancer, the first phase, namely the diagnostic problem, receives little attention as the main consideration is directed toward removal of the growth. It is readily apparent, however, that the reasonable chance of cure depends as much or more on the first phase—namely, early diagnosis—as it does on the second phase, treatment. It is in this first phase that the dentist plays the leading role. In some varieties of mouth cancer, it is more than likely that the dentist will be consulted first for it is entirely reasonable for the patient to believe that the growth or its initial symptoms are due to some dental disorder rather than to a malignant tumor.[1] The symptoms of early mouth cancer are seldom distressing or noticeably painful. When a malignant tumor first appears in the gum, the hard palate, the edge of the tongue or cheek, the location of the lesion and the mild character of the symptoms logically suggest to the patient that there may be some trouble with the teeth.

On the other hand, in many instances of mouth cancer where a dentist has been consulted first, it is obvious that the malignant character of the disease is not recognized. Some form of dental treatment usually is given for a considerable time, and the noncommittal attitude of the dentist tends to reassure the patient that his complaint is not serious. Should the dentist, when first consulted, miss the opportunity to diagnose early mouth cancer, his oversight may bring about an irreparable loss of time in beginning proper treatment and the eventual result may be death from a hopelessly advanced cancer rather than prompt cure of an early growth.

The following four clinical findings in any lesion of the mouth, especially when occurring in combination with each other, should create a strong suspicion, if not a positive clinical diagnosis, of cancer: (1) chronicity, (2) tumefaction, (3) induration, (4) ulceration. In most instances, early intraoral cancer will be seen as a small ulcerated lesion. It is red or reddish yellow in color and often has a ragged granular appearance. The early lesion may not be indurated, but as it grows, the tumor does become firm. Pain and tenderness are present only when the lesion is invasive or secondarily infected.

■ *Team Approach*

During the past year, the dental profession in America celebrated 100 years of existence of its national organization, the American Dental Association. Anyone noting the progress during the past 100 years could not help but observe the changing concept of dental practice in keeping with the ever-expanding horizon of dental education. As this changing picture of dental education and resulting ex-

pansion of practice is viewed, it can readily be seen that the scope of certain areas of practice has likewise expanded and demands of the dentist his undivided attention. Because of the rapid expansion of knowledge, no one person can become proficient in all the technical advances that present-day practice of dentistry or medicine demands, hence the field of oral surgery has developed, particularly in relation to the treatment of intraoral carcinoma.

Oral surgery, the oldest dental specialty, has developed on broad lines to a place demanding respect and at times envy as an important health agency. The future of this branch of dentistry and the direction that it will take will depend on the continuation of a high-level educational program which correctly stresses the basic sciences in developing sound surgical judgment as related to clinical practice. Technical skill, of course, must be developed as in all branches of surgery, but principles rather than technics must be emphasized in the education of the future oral surgeon, whose expanding field of practice carries an increase in responsibility. The specialty of oral surgery, dating back to the days of Garretson in 1864, has bestowed on its practitioners a heritage not to be cast aside lightly or forgotten.[2]

The specialty of oral surgery has developed through formal undergraduate training, graduate study, contributions to the literature and the institution of specialized practices in this field. The American Board of Oral Surgery, through evaluation of candidates for certification, has elevated the standards of this specialty. Medicine and dentistry have established such close cooperative working relations in the past that it is inconceivable that either profession will allow a small minority group within its ranks to disrupt that harmony and impair even slightly the improvements that have come about in the combined surgical care for the afflicted patient. The policy of making the scope of treatment in oral surgery dependent on the qualifications and training of the individual surgeon, within the agreements made at the local level by those concerned with the total health care of the patient, is realistic and workable and should also receive the approval of the medical profession.[3]

When complete responsibility is assumed by the operating team, the preoperative medical work-up in a given case will resolve itself mainly into a search for any systemic abnormality that might be corrected so as to prevent or minimize postoperative complications. The general attitude toward such preoperative study can be stated best with the phrase that "there are no medical contraindications to cancer surgery." This is an entirely reasonable policy since the principal disease itself is always fatal, if untreated. Preoperative medical investigation of candidates for extensive surgical resection should be placed in the hands of an internist with the understanding that he is to decide when, within a reasonable time, the operation had best be done from the medical standpoint rather than if it should be done at all. Obviously, such a policy does not imply the performance of operations for cancer during an acute attack of another disease or in patients in the terminal stages of cardiac or renal disease or general senile deterioration.

After the medical assessment of the

patient, the team is faced with the problem as to what should be done. Should the principal form of therapy be radical surgery or should it be irradiation or a combination of the two methods. It is here that the opinions of the oral surgeon, the general surgeon and the radiologist must be obtained. As has been stated previously, I do not feel that one individual practitioner can make this decision.

First, in discussing radiotherapy, it must be stated that good radiation therapy is a matter not only of clinical judgment but also of precise application of sound physical principles. If this form of treatment is to be successful, careful planning is necessary to obtain a tumor-lethal dose which will at the same time cause the least possible damage to the surrounding tissues. To achieve this, a combination of roentgen ray and some form of radium often is required. Failure may result from overtreatment as well as from undertreatment.[4]

Surgery and radiation frequently are regarded as competitive methods in cancer therapy. Certainly, when a selection must be made between one method and another in an individual case, the two methods apparently do come into competition. The choice obviously should be based on the following single consideration: which method when employed initially will give the best chance of permanent cure? If the evidence is greatly in favor of one or the other, the decision is not difficult. If the results of the two methods so far as cure is concerned are about equal, then the treatment that will produce the best cosmetic and functional result and the least morbidity should be selected. On the other hand, if experience has shown that a given treatment method will produce a higher percentage of cures, then it is hardly reasonable to employ the less effective method first simply because the patient may dread the effects of radiation or because he may wish to avoid an operation. The solution to the problem of which method of treatment should be employed must depend on the cooperation of the radiotherapist, the oral surgeon and the general surgeon. No one of these individuals is skilled in all modalities. The oral surgeon will often be called on to act as referee in the selection of a particular method of treatment, especially where there is a difference of opinion in a given case. This is probably desirable as the oral surgeon may have the best over-all grasp of the situation and complexities involved. This decision is vitally important since cancer is an uncompromising disease, it proceeds steadily if not fully eradicated by the initial method of therapy, and a malignant tumor not completely destroyed by radiation therapy or completely removed by surgery will extend from its periphery.

Well-organized tumor clinics or surgical services where mouth cancer is treated have dentists as active members of the attending staff.

Assuming that the principal form of therapy in these intraoral carcinomas is radical surgical resection, which is most often the case, then certainly the combined efforts of the oral and general surgeon are needed. Frequently these surgical procedures require resection of the mandible or maxilla. The oral surgeon has an intimate knowledge of the anatomy involved and is of much help during the operative procedure, if not actually per-

forming the intraoral portion of the surgery. It is true that the radical neck dissection with its attendant risks and complications is properly the domain of the general surgeon. However, as this operation has developed into a combined procedure, the help of the oral surgeon is irreplaceable in operating in the mouth. As has been mentioned, portions of the mandible frequently are removed with the attendant problems. Our group is concerned with the restoration of this resected mandible. We have used the Kirschner wire replacement and lately attempted to use a plastic prosthesis. As would be expected, these methods have been developed principally by the oral surgical members of our team.

Radical resection in many instances offers the only hope of curing the disease and such treatment usually is mutilating and productive of psychic as well as physical trauma. To submit to such a procedure represents for the patient the greatest tragedy of his life and must be taken into account in all dealings with him. The subsequent surgical procedures required to effect a satisfactory reconstruction likewise constitute a prolonged ordeal which tests the patient's courage and capacity to the limit. Surgery and radiation therapy of mouth cancer inevitably are attended by some scarring and considerable loss of normal tissue. In many of these situations, the use of a prosthesis may completely or at least partially overcome the functional disability or disfigurement. This work obviously is accomplished by the prosthodontist and is not within the realm of the general surgeon. In defects of the maxilla, the obturator is fashioned and made by the prosthodontist. After removal of a portion of the mandible, collapse of the remaining fragment can be prevented by intermaxillary wiring or various fixation splints and later possibly some form of more permanent plastic appliance can be constructed. These facets are handled rather exclusively by the dentist. After radiation or surgery for mouth cancer, the normal tissues of the floor of the mouth, tongue, gums or cheeks are always scarred and inelastic. In these cases, construction of dentures requires the highest degree of accurate fitting, a skill obtained only by experience such as is furnished by the dental profession.

Just as surgical resection must be individualized according to the region involved and the type of neoplasm, so each reconstruction has to be planned individually according to the requirements of the surgical defect, the patient's age and general condition and the prospect of cure of the malignant disease. Such cases usually involve lining the surfaces with skin from hairless area, bone grafting of the jaw, construction of dental prosthesis and use of partial facial prosthesis. Closing off of the nasal cavity can be done best by the dentist with a removable prosthesis so that the entire resected area can be inspected periodically. These prostheses, when properly constructed, are exceedingly functional. They improve speech and contour of the face and increase the masticating surface.[5]

The maintenance of a free airway for the duration of anesthesia and the prevention of aspiration of blood are solely within the domain of the anesthesiologist. Because of developments in this field within the last decade or two, the radical surgery for carcinoma of the mouth has been al-

lowed to be extended. Intubation is now possible either through the mouth or through the nose with the resultant free access to the area for excision. There is nothing more comforting to the oral surgeon and the general surgeon when operating on these patients than to see the perfect control maintained by the anesthesiologist because of the patent airway and complete control of the patient.

■ *Conclusion*

Total care of the patient with carcinoma of the oral cavity basically requires a team approach. These lesions are discovered by the dentist in about 65 per cent of the patients. Frequently they are referred to, and possibly even seen first by, the attending oral surgeon. His fundamental grasp of what constitutes carcinoma and what constitutes good treatment then determines what course this patient is to take. The patient must be evaluated medically by an internist primarily to determine when the patient will be ready for surgery rather than if surgery or irradiation is possible. After this, there usually is consultation between the oral surgeon, the radiologist, and the general surgeon trained in head and neck surgery. This combined approach in making a decision in the therapeutic field probably raises the cure rate considerably. After suitable consultation, the patient is then either irradiated, operated on or treated with a combination of these two means. If an operation is decided on, it is not only desirable but mandatory that the combined skills of the oral surgeon and the general surgeon be used during the operation. The skills of the anesthesiologist complete the picture. Likewise, the postoperative care of these patients, with attention to minutiae, decreases the postoperative complications. The patient's lungs must be inspected periodically. The mouth must receive adequate hygiene, the wounds must be cared for, the cardiac status of the patient must be evaluated continually. This is not an individual, but a team approach.

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*Chief, division of surgery, Sinai Hospital of Detroit.

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■ The Moral Law

The moral law is not made for the convenience of man, rather it is an indispensable precondition for his civilized existence. It is one of the great paradoxes of civilized existence that—in contrast to the existence of the animals and barbarians—it is not self-contained but requires for its fulfillment transcendent orientations. The moral law provides one of them. That is to say, human existence, not in its animal but in its civilized qualities, cannot find its meaning within itself but must receive it from a transcendent source.—*Hans J. Morgenthau. Context 1:34 Spring 1961.*

Scrubbing and gowning in oral surgery

■ *A. Gordon Anderson,* D.D.S., and*
Robert A. Atterbury,† D.D.S., Chicago

The importance of operating room rules and technics cannot be overstressed. The general principles of oral surgical aseptic technic should be adhered to strictly although the method and pattern of work may vary in each hospital.

It is impossible to sterilize the oral cavity, but the use of a sterile technic reduces the possibility of introducing infectious bacteria into the wound. Every detail of surgical procedures should be perfected to insure that the patient under treatment may have every chance to overcome the disease, condition or injury with which he is afflicted.

From the moment an oral surgical operation is decided upon, every phase of the handling of the patient, every detail, no matter how small, is of greatest importance. The following paragraphs present one method of preparing for an oral surgical operation, including cleansing of the hands and arms, application of sterile gown and gloves, and removal of gown and gloves.[1,2]

■ *Cleansing of Arms and Hands*

Directions for the scrubbing procedure are usually posted above the scrub sink. This outline should be followed carefully. A second check of the cap and mask is advisable at this time to insure complete coverage of the mouth, nose and hair. The hands and arms should be cleansed for a full ten minutes, with five minutes for each hand and arm, to remove the bacterial flora from the skin. The need for absolute cleanliness cannot be overemphasized. Fingernails should be short and clean. The first step involves wetting the hands and forearms and rubbing in a generous amount of soap, which is worked into a lather. The hands and forearms are scrubbed thoroughly and rinsed under running water. Running water is used throughout the scrubbing procedure. Any dirt lodged under the fingernails may be removed with a fingernail file or an orangewood stick. The cuticles should also be cleaned and, of course, the hands and forearms should be free from lesions.

After a thorough rinsing, every part of the fingers and nails should be scrubbed with a sterilized hand brush, advancing always from the fingers to the elbow. The arms should be kept bent upward from the elbows at all times so that the drippings will fall from the elbow tips (Fig. 1). Some hospitals provide soap dispensers and others provide bar soap. When the lat-

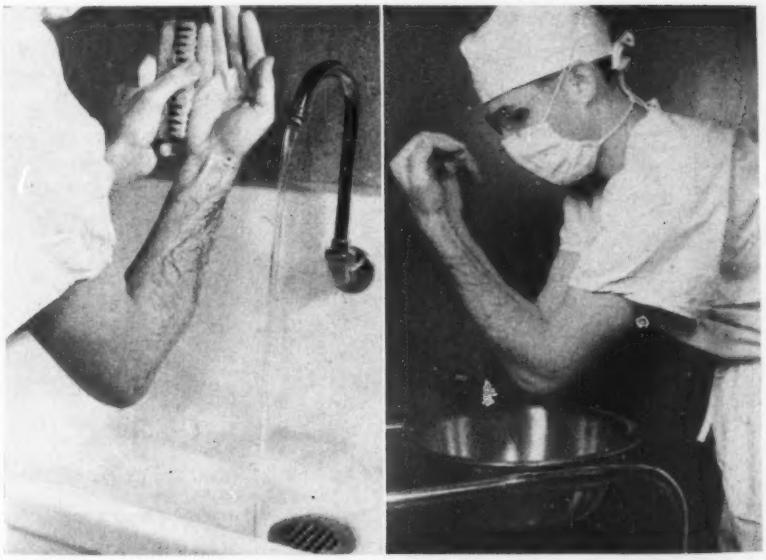

Fig. 1—Left: Arms are bent to allow drippings to fall from elbows. The little finger is scrubbed first and others done in turn, approaching thumb last and finally advancing to elbow. Running water is used throughout scrubbing procedure. Right: Elbows are flexed and hands and arms are rinsed in antiseptic solution

ter is used, the bar is held in the hands during the entire procedure. After use of the soap on the hands and arms, it should be placed in the palm of the right hand under the brush. The left hand is scrubbed first, beginning with the little finger and ending with the thumb. Next the tips of the fingernails are scrubbed, then the palm and the back of the hand and knuckles. Once the hand has been scrubbed the procedure is directed to the outer and inner arm surfaces, ending with the flexed elbows. There is no repetition of the procedure. The hands and arms are now considered to be surgically clean. In proceeding to the operating room, the arms are held away from the body in a flexed position to prevent possible contamination by touching the body.[3]

■ *Drying of Hands and Arms*

The hands and arms are dried with a sterile towel using a rotating motion and proceeding from the fingers to the elbows. Since the area above the elbow is not considered surgically clean, the towel should not be brought back over the clean dried arm and hand. Thus a clean portion of the towel or the other half is used for each arm and hand and the elbow is wiped last.

■ *Sterile Gown Application*

In some operating rooms the surgeon picks up his gown. In others, the scrub nurse holds it. In the former case, the surgeon takes the gown from the set-up table and holds it only from the inside and well out in front while inserting each arm. The outside of the gown, which is

Fig. 2—Nurse holds hands on inside of gown near the shoulders and aids in putting on the gown

folded inward, comes in direct contact with the sterile field. The gown has been autoclaved and is more aseptic than the arms and hands of the wearer. The sterile gown is grasped from the inside at the shoulders and opened. Putting the arms, first one, then the other, into the gown will prevent the outside of the sleeves from flipping back and touching the arm or an unsterilized area. Only the front of the gown between the waist and chest area is considered sterile. A double gown may be used to provide a sterile back field.

The circulating nurse fastens the gown from behind by the tapes on the neck band and at the waist (Fig. 2), but the surgeon must not touch these straps as they may have become contaminated by touching the clothing. (If contamination should occur, the process of scrubbing should be repeated from the beginning before proceeding to the next step. Sterile technic is to be maintained throughout the operation.)

■ *Powdering of Hands*

During the powdering of hands, extreme care should be taken to avoid spreading the powder either over the operative area or the sterile supplies; since it is difficult to sterilize powder in bulk, individual powder envelopes are preferred.

■ *Sterile Gloves Application*

In some operating rooms the surgeon puts on his own gloves, especially in instances in which he dons his own gown, and in this case the glove package is opened in such a way that the outer surfaces of the gloves are not touched by the bare hand. It should be remembered that the skin is only surgically clean and thus the outside of the gloves should not be touched as this will later come into direct contact with the operative field. The packaged glove powder is removed and the hands powdered without permitting the powder to fall on the gloves.

The gloves are prepared with each cuff folded back. The right glove is picked up by the turned-back cuff with the left hand and slipped onto the right hand, leaving the cuff intact (Fig. 3, left). The gloved fingers of the right hand are inserted under the cuff of the left-hand glove and the left hand is now slipped into the glove (Fig. 3, right). Both hands are now gloved and the cuffs of the gown are folded snugly to the wrists. The gloved fingers are slipped under each glove cuff

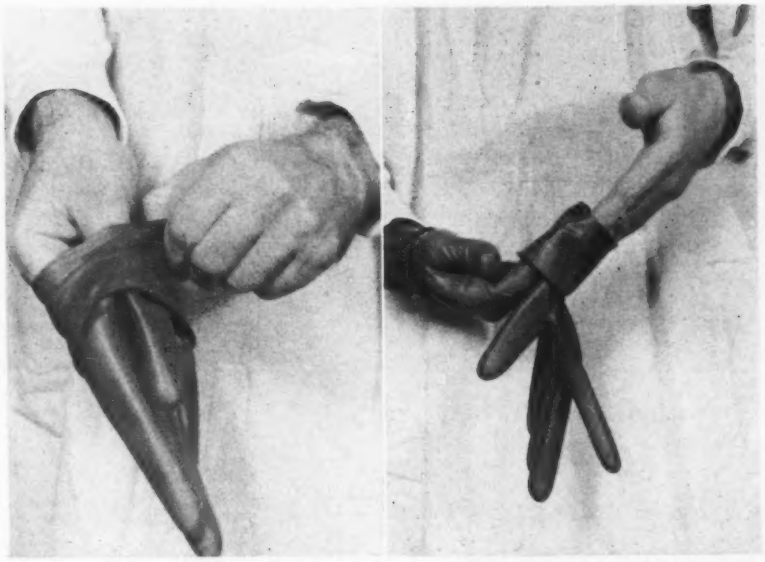

Fig. 3—Left: Glove is picked up by the turned-back cuff and slipped on, leaving cuff intact. Right: Gloved hand is placed under fold of cuff without permitting bare hand to touch the outside and the glove is slipped on

with the thumb holding the wrist of the gown and the glove is pulled over it. If necessary, the glove fingers may be adjusted using a small piece of sterile gauze or the corner of a sterile towel. The gloves should not be made snug until both gloves have been put on.

Another method usually employed is to have the sterile gloves put on by the sterile nurse, in which case the nurse holds the glove facing the surgeon. He places his hand into the offered glove, feeling for all finger openings before making the final downward thrust. The hand may be inserted more easily if the surgeon first places his index finger inside the top of the glove, making tension on the side before the initial finger's insertion. The other hand should be directed in a similar manner. Again the triangular opening may be produced to facilitate insertion, but in this case the index finger of the gloved hand is put under the fold. In either case, the gloves are put on without touching the outer surface with the bare hands.

■ *Precautions in Using Gloves*

In using gloves there are some precautions with which one should be familiar. The gloves should be handled as little as possible. They should be put on in conformity with strict aseptic technic, the bare hands should never touch the outside of the glove, and the outside of the glove should never touch any part of the skin. Gloves, after being put on, may be eased gently in place and smoothed with either the fingers of the other hand using a sterile wet gauze sponge. If the gloves are too

Fig. 4—Completed preparation for oral surgical operation

Fig. 5—Gown is grasped at the shoulder, turned outward and pulled off arm over gloved hand

large and the fingers long, it is best to remove them and put on another pair.

Gloves are easily punctured with needles and injured by rough handling. A punctured glove should be removed at once and replaced with another. While waiting to perform the operation, the surgeon or the assistant may elect to wrap the gloved hands in a sterile towel, always holding the hands above the waist.

At this point everything is in readiness for the contemplated surgical procedure (Fig. 4).

■ *Removing the Gloves*

When several oral surgical patients are to be operated on during the same morning or afternoon, the procedure of rescrub-

bing need not be repeated. The patient with the most infectious condition is usually last on the surgical schedule. On completion of the first operation, the gown is removed over the gloves (Fig. 5). The gloves are removed without the outer surface coming in contact with the bare skin. The hands are rinsed in sterile solution, dried as before and powdered with sterile powder after which another sterile gown is put on following the exact aforementioned procedures.

■ *Comment*

The importance of the rules and technics of the operating room cannot be overstressed. The fundamental principles and methods of operating room procedures as applied to scrubbing, gloving and gowning described herein should serve as a guide for the undergraduate student, the postgraduate student, the dentist and oral surgeon in one specific phase of the principles of operating room technic in oral surgical treatment.

There is no plan superior to all others, and when anyone masters and understands the basic rules of asepsis, he can adapt these principles to suit any set of conditions, as all hospitals function along a similar basic pattern.[4]

*Professor and head of department of oral and maxillofacial surgery, University of Illinois College of Dentistry; head of department of oral surgery, Research and Educational Hospitals.

†Assistant professor of oral and maxillofacial surgery, University of Illinois College of Dentistry; clinical assistant professor of oral surgery, Research and Educational Hospitals.

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■ THE SPICE OF SKEPTICISM

One must not assume that what he knows is necessarily so. A healthy skepticism, kept in proper control so that one's efforts aren't dissipated completely in continual disbelief, is a healthy attribute. It should be used like a spice, not a pasta. So used, it sharpens one's sense of awareness and triggers one's acuity in his scientific observation and thought.

The things we know we don't know; the things we don't even know we don't know; the things we "know" that aren't so—these constitute our veritable infinity of ignorance—the basis of a useful, exciting and rewarding lifetime of research.—*Norman Hilberry. On the Art of Being a Scientist. II. What Scientists Don't Know. Context 1:18 Spring 1961.*

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Ameloblastoma in young patients: *report of two cases*

■ *S. Daniel Seldin, D.D.S., New York*

Ameloblastoma is considered as a rare tumor of dental origin. The origin, as listed by various authors,[1-5] may be from (1) epithelial cells of the enamel organ; (2) epithelium of follicular cysts; (3) surface epithelium of the oral cavity; (4) misplaced epithelial cells, and (5) debris of Malassez's rests.

The ameloblastoma is epithelial in origin and may be hard or soft (cystic). It is found most commonly in the mandibular third molar region but may be seen in other portions of the mandible or maxilla.[5] About 83.7 per cent of these tumors are located in the mandible and about 16.3 per cent in the maxilla.[5] It may arise in the walls of follicular cysts.[6] Some authors believe that cystic ameloblastomas are caused by pressure degeneration of parts of the solid types. These tumors know no bounds as to age, sex or race.[4]

Roentgenographically the ameloblastoma appears as a solid or radiolucent area which is often multilobulated and which may cause expansion of the surrounding cortical bone. It may resemble a simple cyst, a multilocular cyst, a myxoma or a central type giant cell tumor. It also may give the appearance of an infiltrating growth.[3]

This tumor is benign though some authors speak of malignant transformations.[7,3] The authenticity of these transformations has not been definitely proved.[1,2] The ameloblastoma is called locally malignant because of its tendency to recur unless thoroughly and completely removed.[2,4] Recurrence may develop at any time from a few months to over ten years.

The following two cases of ameloblastoma occurred in children under five years of age. One tumor was found in the maxilla and the other in the mandible. Both were treated by conservative surgery.

AMELOBLASTOMA OF THE MAXILLA—An 18 month old boy was referred to our office on April 30, 1946 for examination of an ulcerated lesion of the left side of the maxilla in the region of the first deciduous molar. This had been noticed first by the mother when the baby was six months of age and it was thought to be the eruption of the first deciduous molar. The child was uncooperative and would not permit roentgenograms to be taken.

A cursory examination revealed an ulcerated lesion 1.5 cm. by 1 cm. in diameter which distended the ridge 0.5 cm. It was strawberry red and bled easily. The past history was negative. The upper left first deciduous molar was not visible. It was decided to take a section for biopsy to rule out a possible malignancy.

General anesthesia was used and an incision was made through the mucosa on the ridge, from the region of the unerupted second deciduous molar through the lesion to the labial of the cuspid. On completion of this incision it was noted that because of internal pressure, the mucosa separated from the lesion spon-

taneously. The incision was then enlarged to the tuberosity and high over the apex of the lateral incisor to the mucobuccal fold. The buccal mucoperiosteum was further elevated exposing the buccal bone; the perforation through the buccal mucoperiosteum and crest of the ridge was enlarged with rongeur forceps and the tumor enucleated. This tumor was made up of many "beads," about 1 cm. in diameter and was the consistency of soft cartilage. It extended high into the maxilla where the undeveloped antrum would be located. The unerupted deciduous first molar was removed with the growth. When all visible tumor was removed, the mucoperiosteum was replaced and sutured with no. 000 chromic gut. A postoperative roentgenogram was taken with the baby under anesthesia (Fig. 1). Our impression was that the tumor was an ameloblastoma or a composite odontogenic tumor.

The tissue was sent for microscopic examination to Charles G. Darlington, M.D., pathologist of New York University. His report was as follows:

"Macroscopic examination. The specimen consists of several irregular pieces of soft tissue and deciduous (D) tooth with incompletely formed root. One of the smaller pieces shows a mucous membrane covering on one surface. All of the other pieces are translucent in appearance and gelatinous on cutting.

"Microscopic examination. The sections confirm irregular masses of tumor tissue in which the tissue varies between a very embryonic fibroblastic structure and a myxomatous stroma. Scattered in the tissue are strands and islands of basal ameloblastic cells. In some fields these cells form a latticework and in other areas the cells are in groups with the peripheral layer consisting of columnar cells. The other pieces of tissue show an actively proliferating fibroblastic stroma with many capillaries. Here chronic inflammatory cells litter the entire structure. The diagnosis is ameloblastoma" (Fig. 2).

Healing was uneventful. Postoperative roentgenograms were taken periodically until 1955 at which time we lost contact with the patient. These roentgenograms showed no evidence of recurrence. The teeth were developing and erupting properly. The bony texture appeared normal (Fig. 3).

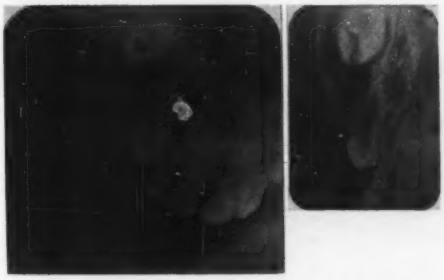

Fig. 1—Postoperative view taken April 30, 1946 showing region destroyed by tumorous growth in upper left first deciduous molar region. (Taken when patient was anesthetized)

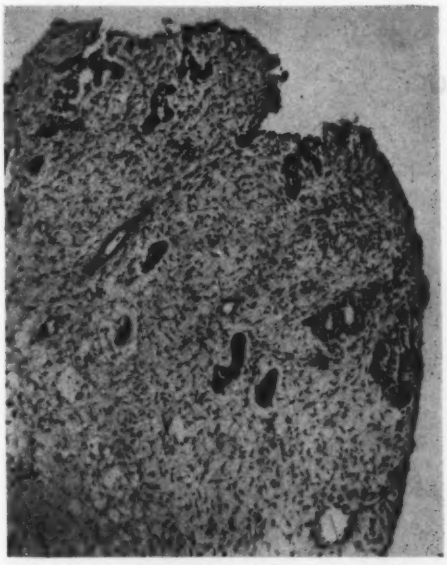

Fig. 2—Tumor tissue

DENTIGEROUS CYST WITH AMELOBLASTIC CHANGES—On January 26, 1953 a four year old boy was brought to our office with a history of intermittent pain in the posterior portion of the right side of the mandible for the previous

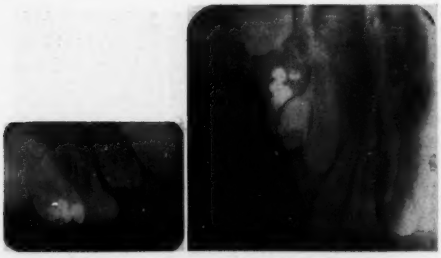

Fig. 3—View taken June 9, 1955. No evidence of recurrence. Bone appears to have normal architecture

two months. A swelling over the right ramus and angle of the mandible had been noticed on January 24.

Roentgenographic examination revealed a large radiolucent area involving the body and ramus of the mandible extending from the lower right second deciduous molar to and involving the coronoid process. The first permanent molar was at the inferior border of the mandible; the bud of the second molar was situated in the coronoid process of the right ramus. The bud of the second bicuspid was not visible (Fig. 4).

Fig. 4—Preoperative roentgenogram taken January 26, 1953. Almost the entire anterior portion of ramus and body of mandible in molar region are destroyed by growth. Note absence of second bicuspid and bud of second molar is in the coronoid process. Lower right first molar is at inferior border of mandible

Aspiration of the radiolucent region yielded cystic fluid, 3 cc. on test. A marsupialization (modified Partsch) was decided on for cyst shrinkage.

With the boy under a general anesthetic, a 0.5 cm. circle of mucosa and underlying eggshell-thin bone was removed exposing the cystic membrane buccally on the ridge in the region of the first permanent molar. A portion of the exposed cystic membrane was removed for microscopic examination. A trimmed plastic dropper from an anesthetic bottle was placed through the opening into the cavity to maintain drainage of cystic fluids. The pathologist's report was as follows:

"Macroscopic description. A shriveled, curled piece of soft tissue, conceivably opened out wall of sac.

"Microscopic description. The fragmented specimen reveals several tissue masses which are densely cellular and extremely vascular. Closer inspection discloses these cells to have protoplasmic processes, strongly suggestive of the stellate reticulum observed in the enamel organ. For the greater part, these enclose islands lined with cylindrical cells surrounding connective tissue and capillaries. There are, however, a few central areas which have undergone degeneration. These latter spaces are distended by an accumulation of exudate which has compressed the bordering cells into flattened units. The diagnosis is potential ameloblastoma" (Fig. 5).

The patient was seen at regular intervals, the cavity irrigated and roentgenograms taken periodically to ascertain the progressive decrease in the cystic cavity.

On May 9 the drainage tube fell out and a rubber drain was inserted to maintain drainage. Lipiodol was injected into the shrunken cyst cavity to ascertain its size. During the cyst shrinkage the first molar began to come into position for eruption and the second molar bud descended into approximately the third molar region. The second bicuspid bud began to develop. Drainage was maintained until January 1954.

On January 15, 1954, under general anesthesia, the region was opened and the remaining tumorous tissue removed. The incompletely developed first molar was enucleated and trimmed of all tumorous tissue and reimplanted in the hope of continued growth and eruption. The wound was then sutured closed. The pathologist's report was "ameloblastoma."

The patient was observed until February 9, 1955 when suppurative drainage was noted in the region of the first molar. Roentgenograms showed no further development of the first molar from that shown in January 1954. Palliative treatment and chemotherapy was instituted. Drainage stopped and observation continued until June 20, 1956 when it was decided that the lower right first molar had developed a necrotic pulp and growth had ended.

On September 20, under general anesthesia, the lower right first molar was removed surgically and adjacent tissue enucleated. This tissue appeared to be granulation tissue and was sent for microscopic examination. The pathologist's diagnosis was as follows:

"1. Cyst or cavity partially lined by squamous. Smoldering infection in 'wall.'

"2. Cystic changes at the root of molar tooth. Signs of smoldering infection."

Postoperative observations were continued with yearly roentgenograms. There has been no evidence of recurrence of this tumor. The last roentgenogram was taken on December 26, 1958 and revealed what appeared to be the beginning of development of the lower right third molar. There is complete bone regeneration with good architecture. There is no clinical evidence of bone expansion or swelling. There are no visible scars (Fig. 6).

DISCUSSION—There are cases of ameloblastoma in which radical resection of the involved part is indicated. In the majority of the patients we have seen, however, conservative surgery has been the treatment of choice and the results have been gratifying. The retention of normal facial contour and the absence of disfiguring scars add credence to this approach. Esthetically it is better to be conservative; however, the patient should be observed for a mini-

Fig. 5—Specimen of membrane removed at time of fenestration, January 26, 1953

Fig. 6—Bony architecture still shows normal tendencies. Note appearance of bud of lower right third molar when patient is aged ten

mum of ten years and if a small recurrence does appear, small block resection may be advisable.

The second case shows the importance of microscopic examination of tissue that is removed.

Through careful observation, should a recurrence develop, it can be found early and removed by means of small block dissections.—*57 West Fifty-seventh Street.*

SUMMARY—The literature on ameloblastoma shows the tumor to be benign with tendencies to recur. There is doubt as to the authenticity of reported malignant changes.

Two patients of a very early age (1½ and 4 years) came for treatment of ameloblastoma. Both patients were treated conservatively and both are developing normally, one for 11 years and the other for 6 years.

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Double lip: *report of case*

■ *C. P. Chaconas,* D.D.S., Silver Spring, Md.*

Double lip is the term applied to a labial deformity which consists of a superfluous fold of mucosal tissue occurring immediately within the vermilion border of the lip that gives the appearance of a duplication of the lip affected.

The anomalous double lip has been reported as (1) being caused, or at least accentuated, by the mucosa of the lip being sucked constantly and drawn between the teeth,[1] and (2) a true congenital anomaly present at birth but which does not become noticeable until after the eruption of teeth.[2]

On the basis of the reported cases of lip defects, double lip is apparently the rarest form of lip anomaly. Its incidence is greatly exceeded by that of cleft lip; notched lip, frequently associated with cleft lips; paramedian labial pits, and labial frenum deformities.

Double lip may be recognized easily in the superior lip since the excess mucosal tissue can be seen hanging below the inferior border of the lip proper. The amount of pendulous tissue which can be seen varies in degree with the individual patient. The apparentness, in turn, is based not only on the amount of redundant tissue but upon the conscious and habitual compensatory effort by the patient to limit the amount of tissue shown. The compensatory mechanism in the case to be described was a "closed mouth" manner of speech with limited lip motion and a conscious limitation of smiling, since the condition was most noticeable at that time.

A double lip defect is less likely to be noticed or recognized when it exists in the lower lip, probably because the fold in the lower lip tends to gravitate down into the mucobuccal fold.[1] Thoma[1] states that he has never seen one in the lower lip. A case involving the lower lip was reported by Dingman.[3]

The significance of double lip is primarily esthetic. Aberrations of personality and behavior traits, however, may occur secondarily as the result of the cosmetic defect.

Above left: Double lip as seen with lips parted in half smile and during relaxed speech. Above right: Postoperative view of lips with approximately the same degree of opening as seen at left. Below: Postoperative view of lips at rest

REPORT OF CASE—On March 17, 1956, at the request of his wife, a staff nurse, this 25 year old white man was seen at the oral surgery department of the Millard Fillmore Hospital, Buffalo, N.Y. He was asymptomatic and without complaint. He expressed concern, however, about a fold of tissue associated with his superior lip which had been present since early childhood. His concern was not confined to himself but was projected to include a four month old son whom he feared might develop a similar condition. No other member of his family had a defect of this type, and the patient denied a lip sucking or chewing habit.

EXAMINATION—The patient's past medical history was noncontributory. His health had always been good. He had a hygienically clean oral cavity and a well cared for dentition. The oral mucous membranes and tongue were not remarkable. The superior lip had a redundant fold of mucosa just inside the vermilion border. It was notched in the midline and had the appearance of a cupid's bow. When the lips were parted, and during speech, the maxillary central incisors were only partially visible. The remainder of the maxillary anterior teeth were concealed by the excess tissue (illustration, above left). When the patient smiled, the fold of tissue became flattened against the maxillary anterior teeth and resembled, at first glance, a massive gingival hypertrophy which covered the cervical third of the clinical crowns. The lower lip was not remarkable. There was no speech defect.

When advised that the excess tissue could be removed surgically, the patient expressed his desire for correction.

PROCEDURE—Lidocaine 2 per cent, 1 to 50,000 epinephrine, was used for bilateral orbital blocks. The base of the redundant fold was then outlined with methylene blue applied with a hypodermic needle.

The excess tissue was grasped with Allison clamps and placed under slight tension. An incision was made along the line previously marked on the outer aspect of the fold and

then repeated on the labial side. Scissor dissection was utilized to free the specimen completely from the submucosa. The few bleeding points were tied with no. 0000 plain gut, and the margins of the wound were undermined and closed in the usual fashion.

The following day the lip was moderately edematous with a slight inferior dimpling in the lateral incisor region of the right side, but the patient was comfortable and without complaint.

Sutures were removed on the fifth postoperative day at which time a slight excess of mucosa was found at the midline. This was corrected and when seen for final observation, a favorable functional and esthetic result was evident (illustration, above right and below).

SUMMARY—Double lip, one of several defects occurring in the lips, is observed rarely. An adult white man with a double lip deformity affecting the superior lip was seen. The condition was corrected surgically, and when the patient was seen for final observation, a favorable result was evident.

Based on observations made by the patient's family and the absence of a lip sucking or chewing habit, it was concluded that the anomaly in this patient was congenital in origin. The offspring of the patient will be followed to evaluate the possibility of a familial transmission of this defect.—*8605 Cameron Street.*

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Mandibular sulcus extension by an Esser implant: *report of case*

■ *Henry C. Thompson,* D.D.S., M.S., Fort Hood, Texas*

*Formerly, chief resident in oral surgery, Millard Fillmore Hospital, Buffalo, N.Y.

Skin grafts may be used intraorally for mandibular sulcus extension in certain instances of a deformity in which scar contracture and fixation decrease the mandibular labial sulcus depth. This scar contracture may limit the mobility of the lower lip and the complete approximation of the lips.

Deepening of the mandibular labial sulcus may be achieved by use of an Esser split thickness skin graft implant in extreme cases.[1] This is a split thickness skin graft applied around formed dental compound and buried in the surgically prepared site.

This method of mandibular labial sulcus extension was used in the case to be described herein. The scarring which followed a full thickness pedicle graft from the skin of the chest to the lower lip limited mobility of the lower lip and approximation of the lips.

REPORT OF CASE—The patient, a 29 year old white master sergeant, was admitted to Walter Reed Army Hospital on transfer from the 97th General Hospital for further excision of the lower lip and a bilateral suprahyoid lymph node dissection for a melanoma.

HISTORY OF PRESENT ILLNESS—This patient had first noticed a small ulcer of the lower lip six months prior to admission. He had been

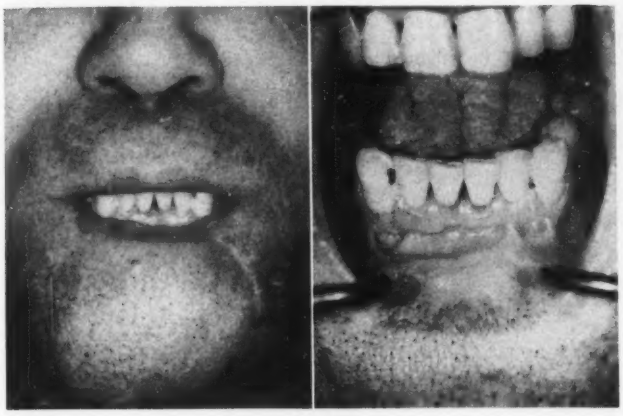

Fig. 1—Left: View showing inability of lip to approximate after transfer graft reconstruction of lower lip. Right: Intraoral view showing scarring in labial sulcus

admitted to the 97th General Hospital on January 15, 1953 for excision of the lesion. On January 27 it was excised and was reported as a malignant melanoma. He was transferred to Walter Reed Army Hospital for further treatment, being admitted on February 9.

PHYSICAL EXAMINATION AND LABORATORY FINDINGS—There was a well healed scar of the lower lip which caused his lower lip to be constricted (Fig. 1). His blood pressure was 140/100 on admission. No other abnormalities were noted.

The complete blood count and urinalysis were within normal limits. The cardiolipin flocculation test was negative. The chest roentgenogram revealed no abnormalities and the electrocardiogram on July 7 showed changes consistent with hypertension.

COURSE IN HOSPITAL—After a wide excision of the lower lip and bilateral suprahyoid lymph node dissection on March 10, 1953, a transfer graft from the chest to the lower lip was placed by the surgical service. Division of the graft was performed on August 24. On February 23, 1954, during the patient's rehabilitation, he was referred to the oral surgery service for evaluation of scar contracture of the lower labial sulcus. A sulcus graft was recommended.

On February 25, under thiopental sodium induction and nitrous oxide-oxygen anesthesia administered through nasoendotracheal intubation, the patient was placed in a supine position and the oral pharynx was packed with gauze. With the oral cavity prepared with aqueous benzalkonium chloride, and the chin with hexachlorophene, the patient was draped in a manner which would expose the oral cavity.

An incision was made in the defect of the mandibular labial sulcus from the right to the left first bicuspid region. Dissection was carried down so as to create a pocket for the Esser implant.

The inner surface of the left thigh had been prepared with hexachlorophene and draped. A Padgett dermatome was used to remove a split thickness of the skin 4 by 4 cm. Dental compound was softened and molded to fit the prepared pocket. The skin was placed and sutured with no. 00 chromic catgut around the dental compound with the outer surface toward the compound. This implant was placed within the prepared pocket and the oral mucosa reapproximated and closed with no. 0000 Dermalon interrupted sutures.

The thigh wound was dressed with petroleum jelly gauze, 4 by 8 inch gauze, and two inch Ace bandage. The patient was sent to the recovery ward in good condition. On March 5 the dental compound was removed and an

Fig. 2—Left: Postoperative intraoral view taken June 29, 1954 showing result of sulcus extension by Esser implant. Right: View showing ability of lip to approximate after sulcus extension

acrylic stent constructed. This stent was placed on March 8.

On April 17 a subcutaneous abscess developed in the right border of the graft. This abscess was incised, cultured, and through and through drainage established. Procaine penicillin, 600,000 units, was given daily and 500 mg. streptomycin twice daily for five days. The culture report revealed hemolytic *Staphylococcus aureus* sensitive only to chloramphenicol; therefore, penicillin and streptomycin were discontinued and 500 mg. chloramphenicol was given twice daily for seven days, at which time the infection was controlled.

The patient was followed until June 29, 1954 at which time there was no further evidence of scarring after the placement of the skin graft (Fig. 2, left).

DISCUSSION—Intraoral skin grafts may be used for correction of severe scar contracture deformities which decrease the mandibular labial sulcus depth and impair lip function.

The region from which the skin graft is to be taken should be as free from hair as possible. The graft usually can be cut sufficiently thin to avoid difficulty on this account, but it must be borne in mind that the tendency to shrink increases with the thinness; on the other hand, excessively thick grafts do not "take" well.

The Esser implant graft is held in place by dental compound. Immobilization of this compound stent supporting the graft is accomplished by suturing the oral mucosa over the buried graft and stent.

Antibiotics are used as a prophylactic measure until the compound stent is removed. Generally the stent is left undisturbed for about ten days; however, prompt replacement of the stent with an acrylic prosthesis is essential. A delay in replacement of the dental compound with the acrylic stent may permit enough shrinkage of the graft to render insertion of the prosthesis impossible. Depending on the thickness of the graft, the prosthesis must be worn continuously at least for several months except when it is removed briefly for cleaning.

SUMMARY—The patient, a 29 year old master sergeant, had his lower lip excised in continuity with a bilateral suprahyoid lymph node dissection for a malignant melanoma of the lower lip. The plastic reconstruction of the lower lip by a transfer graft had caused shortening of the mandibular labial sulcus through scarring. This prevented the patient from approximating his lips with minimal movement of his lower lip. An Esser implant consisting of a split thickness skin graft around dental compound was buried in a surgical defect prepared in the mandibular labial sulcus. As soon as it

was evident that the split thickness graft had taken, the dental compound stent was removed and an acrylic stent placed in the sulcus to maintain its depth. This procedure was complicated by a subcutaneous abscess in the region which was controlled by incision, drainage and specific antibiotics. By this procedure, a mandibular labial sulcus was provided and the patient was able to approximate his lips and greater mobility of the lower lip was provided (Fig. 2, right).

*Lieutenant Colonel, U.S. Army; chief, oral surgery, U.S. Army Dental Detachment.

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Treatment of displaced condylar fractures in children: *report of cases*

■ *William Rakower,* D.D.S.; Alan Protzell,† D.D.S., and Martin Rosencrans,† D.D.S., New York*

In general oral surgeons agree that the best treatment for simple fractures of the condyle where no displacement exists is the conservative one. Simple intermaxillary fixation, as a rule, suffices to achieve good results. Concerning displaced and dislocated condylar fractures, however, there is some difference of opinion. This difference arises when such fractures are in adults or in children. The so-called two schools of thought on this subject generally can be divided into the one in which the conservative approach with intermaxillary fixation is advocated and the one where the open operation or surgical approach is advocated.

Three instances of displaced and dislocated condylar fractures in children will be presented in this paper to illustrate the treatment and results obtained when the conservative approach was used.

CASE 1—A 12 year old boy was first seen in the office of one of us (W.R.) on August 21, 1957. One day prior to this visit the patient had fallen while riding a bicycle and had struck his face against the pavement. He was not unconscious and was not taken to a hospital; instead he was seen by his physician who ordered roentgenograms of the facial bones. These revealed a fracture through the neck of the left condyloid process.

Clinically it could be seen that the patient was not able to occlude his posterior teeth.

Roentgenograms showed a displaced and dislocated fracture of the left condyle with the condyle displaced medially and apparently lying at an angle of almost 90 degrees to its normal position (Fig. 1, left).

Under local anesthesia, upper and lower arch bars were placed, and with the use of intermaxillary rubber band traction, normal occlusion was restored and fixed.

The intermaxillary traction was removed about one month later, on September 20. Function gradually returned to normal; occlusion remained normal. All mandibular excursions were made easily. In October, 1960, when the patient opened his mouth, there remained a slight deviation toward the affected side. The

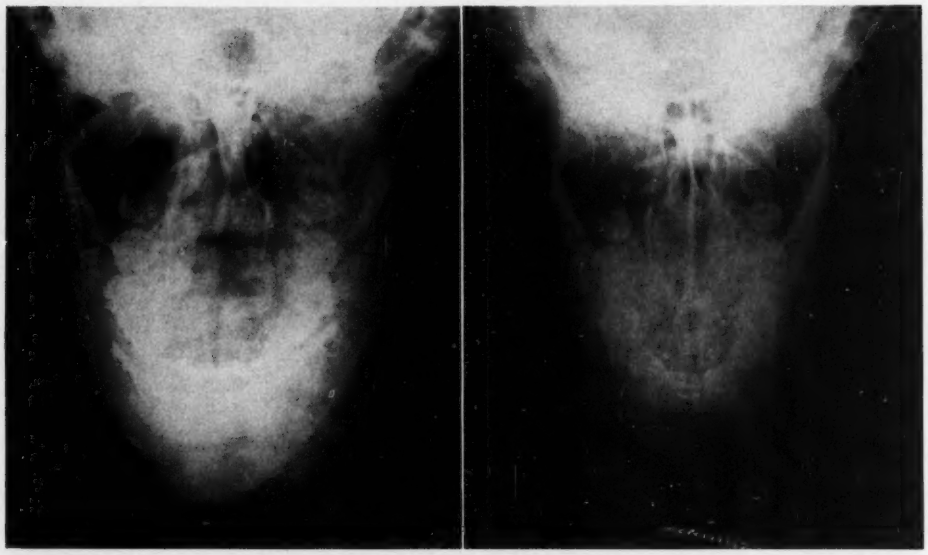

Fig. 1—Case 1. Left: Displaced and dislocated fracture of left condyle in 12 year old boy. Right: View taken about one year later showing apparent straightening of condyle

patient had no complaints and was able to chew and masticate his food as always.

Roentgenograms taken in October, 1959, about two years after the accident, showed a completely recontoured condyle in a relatively upright and normal position (Fig. 1, right).

CASE 2—An eight year old boy was admitted to the Jacobi Hospital on August 1, 1959 with a history of falling from a tree and striking his chin on a rock three days previously. He had sustained lacerations of the lip and chin which had been sutured. Skull and mandible roentgenograms were taken and revealed a fracture of the right condyle through the neck of the condyloid process with the condyle displaced medially (Fig. 2, left).

During examination, pain was elicited on palpation of the right temporomandibular joint in the opening and closing movements. There was no evidence of malocclusion. The dentition was normal for an eight year old, in good repair, with minimal spacing and with teeth present in each quadrant. The sutured lacerations of the lip and chin were evident. The tympanic membrane of the right side was injected while that on the left side was normal.

Under local anesthesia, with adequate premedication, wires were placed on upper and lower teeth and the jaws immobilized with intermaxillary elastics. About three and a half weeks later the intermaxillary elastics were removed.

Examination ten months later revealed that the patient had normal opening and closing as well as lateral mandibular movements. No deviation was noted on opening; on palpation the condyles seemed to move similarly with no pain, clicking or grating.

Roentgenograms taken at this time showed the condyles to be symmetrical (Fig. 2, right).

CASE 3—A three year old boy was admitted to Jacobi Hospital on September 26, 1959 shortly after having been run over by the front wheel of a small foreign automobile. The tire passed over his head.

On examination the child was seen to be

lethargic but reacted to stimuli. His blood pressure was 100/60 with pulse 100 and regular, and respirations 28 and regular. There was a laceration down to the periosteum in the left supraorbital region, and the right infraorbital and zygomatic regions were swollen. The region over the right temporomandibular joint was tender. Clotted blood was visible in the left nostril and fresh blood could be seen in the right ear. The tympanic membrane, however, was normal. The teeth were normal in number and alignment. The patient could not close his jaws completely and the movements of the mandible were limited.

Roentgenograms revealed a fracture of the neck of the right condyloid process, with the condyle displaced medially (Fig. 3, left). No skull fracture was noted.

Temporary treatment consisted of the application of a Barton-type bandage and maintenance of antibiotic therapy. The left supraorbital laceration was sutured.

When the vital signs remained stable for several days, clearance was given for more definitive treatment. On October 1, under general anesthesia, Ivy-type loops were placed about the teeth using stainless steel wire and the occlusion restored and maintained by means of intermaxillary elastics.

Four days postoperatively the patient was discharged from the hospital, to be followed in the outpatient clinic. On October 10, just nine days postoperatively, the patient was taken to a local dentist who removed the intermaxillary elastics and all the wires.

The patient returned to our clinic on March 17, 1960, about five and a half months after the accident. There were no complaints; occlusion was normal, as were the mandibular excursions. Roentgenograms revealed the fractured segments to be well healed and in normal position and alignment (Fig. 3, right).

DISCUSSION—It seems axiomatic that in general, the simplest method of treatment which will produce good results is the treatment of choice. In the case of fractures of the mandible, "good results" generally are meas-

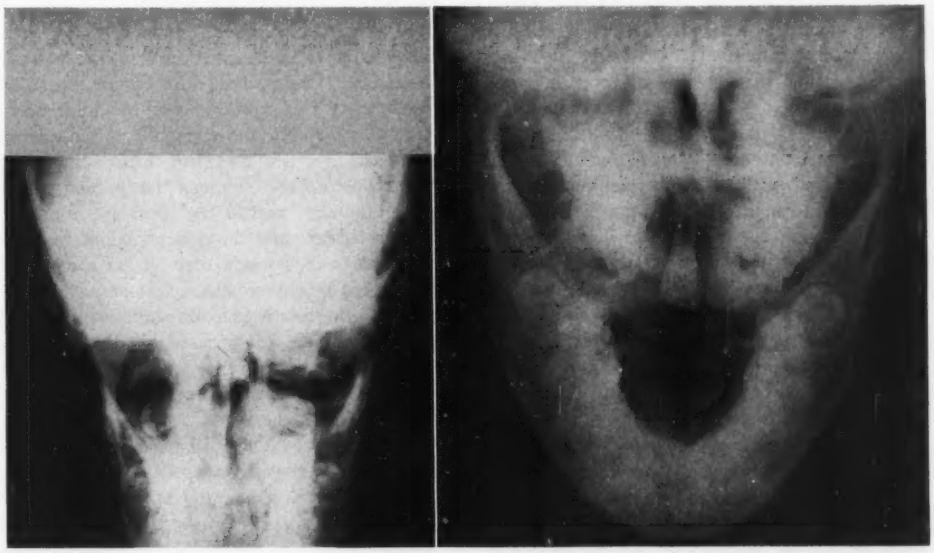

Fig. 2—Case 2. Left: Fractured right condyle in eight year old boy. Right: View taken about 11 months later showing result of functional reconstruction of fractured segments

Fig. 3—Case 3. Left: Fracture of left condyle with medial displacement. Right: View taken about six months later showing fractured parts well aligned and in normal position

ured in terms of restoration of normal occlusion and mandibular excursions. Occlusion and function are of prime importance, whereas attaining perfect anatomic alignment of the fractured segments as seen roentgenographically is of secondary importance. In discussing fractured condyles in children, however, another factor must be considered; that is, the factor of growth.

In the mandible the main growth center is the hyaline cartilage of the mandibular condyle.[1] Growth at the condyle moves the body of the mandible forward and downward and is responsible for the increase in the over-all length of the mandible and the height of its ramus.[1,2] Mandibular growth can be considered the leading factor of facial growth.[2]

A condylar fracture in a child carries with it the risk of possible injury to the growth center. The age at which the injury occurs, however, is also of great importance. According to W. D. MacLennon, the mandibular growth that is associated with the condylar growth center occurs when the child is between 1 and 5 years of age, so that the critical period for a condylar fracture would be from 1 to 5 years, with perhaps the most critical situation being a fracture dislocation in a child of 2½ years or less.[3]

With the healing of fractures there is functional reconstruction. Since functional stresses shape the bone, even malaligned fractures tend to reassume their original prefracture state. This process, furthermore, seems to progress at a fairly rapid rate in children. In Case 3 (Fig. 3), the fractured and displaced condyle, as a result of functional remodeling or reconstruction, resumed its normal shape and alignment within the short space of five months. The same thing occurred in the two other cases in a year's time. If, as a result of functional reconstruction, good complete alignment of the fractured parts occurs with use of the conservative approach within the relatively short time of six months to a year, it is reasonable to assume that future growth will not be impaired.

It is felt by some[4] that straightening does not occur in true fracture dislocations of the condyle and that "fracture dislocations in children probably always should be managed by open reduction of the condyle fragment."[4] The risks of surgery in this region are considerable, however, and can be justified only if the

chances of recovery with more conservative treatment are relatively poor.

Since the cases described herein were not explored surgically, it cannot be said with certainty that they were true displaced and dislocated condyles, if this be defined as herniation of the condyle through the joint capsule. It would seem from the roentgenogram, however, especially in Case 1, that the requirements of this definition were met. The three cases had one other feature in common which may also account for the good results; that is, the fact that although the condyle was displaced in each instance, the fractured ends of the condyle and ramus seemed to be in close apposition. Despite this, however, the remarkable way in which the condyle appears to straighten itself up is of great interest.

SUMMARY AND CONCLUSION—Unilateral fractured and displaced condyles in three children are reported. The conservative treatment with simple intermaxillary fixation was used in all three instances. Functional reconstruction and good alignment as well as good function resulted. Condyle fractures in children, including some which are displaced and dislocated, may be treated conservatively with good results.

*Chief, dental service, Bronx Municipal Hospital Center.
†Residents in oral surgery, Bronx Municipal Hospital Center, 1959-1960.

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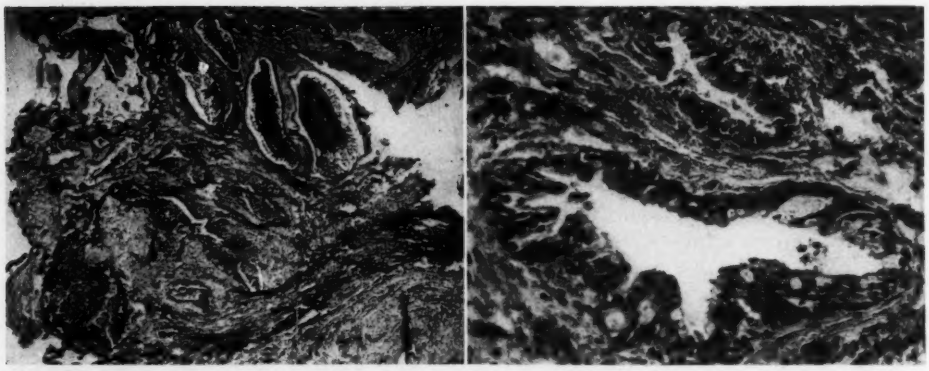
Muco-epidermoid tumor arising from ectopic minor salivary glands in the maxilla: *report of case*

■ *A. P. Chaudhry,* B.D.S., M.S., Ph.D., Pittsburgh; T. H. Dedolph, Jr., D.D.S., M.S.D., St. Cloud, Minn., and R. A. Vickers, D.D.S., Minneapolis*

The term "muco-epidermoid tumor" was initiated by Stewart, Foote, and Becker[1] in 1945 for a neoplasm of salivary gland origin which is essentially composed of epidermoid and mucus-producing cells. The neoplasm had been described in earlier literature by other names. It most commonly occurs in the major salivary glands, chiefly the parotid gland. Stevenson and Hazard[2] in 1953 reviewed 157 cases of muco-epidermoid tumors from the literature, 45 of these being of minor salivary gland origin. The tumors were found in the palate, tongue, lips and cheeks.

Bernier and Krogh[3] (1949) reported a case of cystadenoma of the mandible which they interpreted as a muco-epidermoid tumor arising from the aberrant salivary glands. Recently, a case of cystic muco-epidermoid tumor of the mandible has been reported by Szerlip.[4]

According to Stewart and co-workers, the muco-epidermoid tumors arise from the ductal epithelium of the major or minor salivary glands. Barla-Szabo,[5] however, believes that muco-epidermoid tumors of the oral cavity originate from the epithelium of the mucous membrane. In five of his nine cases, the author



Left: Specimen showing numerous glandular cystic spaces throughout connective tissue stroma. Right: View showing dilated ducts lined by several layers of squamous, basal, intermediate and mucin-producing cells

could demonstrate a connection between the tumor mass and the overlying mucosa. In the other four cases, the lack of connection was attributed, possibly, to a wrong choice of plane or sectioning.

REPORT OF CASE—A 16 year old white girl noticed a small mass on her left palate in early 1958 at which time she also had a severe toothache. She consulted her local dentist who extracted a carious upper left second molar and also incised the swelling, but there was no discharge. The swelling progressively increased in size, and two weeks later she went to a physician who, again, lanced the lesion and also prescribed antibiotics. The swelling persisted, and she consulted an otolaryngologist, who referred her to an oral surgeon.

Clinical examination by the oral surgeon revealed a 2.5 by 1.5 by 1.0 cm. swelling in the posterior part of the palate opposite the molars. Roentgenologic examination revealed the presence of an impacted left third molar but failed to show any distinct bone disease.

It was decided to extract the third molar and also to procure a biopsy from the lesion. Under block and local infiltration anesthesia a large buccal mucoperiosteal flap was raised extending from the region of the left upper second bicuspid to the tuberosity region. The embedded tooth was visualized and easily elevated. The palatal mucosa was then raised, and a well-defined mass was removed from the bony crypt. The mass was firm but mucinous. The buccal and palatal flaps were sutured in position. The mass was divided into two halves, one of which was sent to the pathology laboratory of the School of Dentistry and the other to a local hospital.

The former specimen was composed of dense collagenous connective tissue, normal mucous glands, and a large number of cystic glandular spaces lined either by a single layer of flattened, cuboidal, or tall columnar cells (see illustration, left). The lining epithelium of some dilated spaces was several layers thick, and the cells were chiefly of intermediate, squamous and mucin-producing variety (see illustration, right). The mucin-producing cells were positive for mucin with mucicarmine stain. The epithelial cells were well differentiated without any evidence of hyperchromatism, pleomorphism or mitotic activity. The microscopic picture was compatible with the diagnosis of "muco-epidermoid tumor."

In view of the fact that all muco-epidermoid tumors are considered potentially malignant, it was the consensus of the staff of the University Hospital that a partial maxillectomy be performed on this patient. On admission into the hospital the patient gave a possible history of chorea at the age of 12 years and, therefore,

was given prophylactically 100,000 units of penicillin per day by mouth for three days. On July 7, 1958, with the patient under general anesthesia, a partial left maxillectomy was performed with a good margin around the site of the previous surgery. The postoperative course was uneventful. The pathologic report on this specimen was negative for any residual tumor. The patient has been followed regularly for three years without any evidence of local recurrence.

DISCUSSION—Muco-epidermoid tumors have been designated as malignant,[2,6] semimalignant[5] and partially malignant.[7] Stewart and others, on the basis of clinical and histologic features, differentiated these tumors into benign and malignant varieties. However, they found that some of the tumors which were classified as benign not only recurred but also yielded metastases. Foote and Frazell,[8] therefore, have divided these tumors into low-grade and high-grade malignant varieties. Linell and Willis[9] preferred to consider them as muco-epidermoid carcinoma irrespective of their microscopic features. Undoubtedly, there have been cases of muco-epidermoid tumors in which clinical behavior was at variance with microscopic features, but to label all tumors of this type as carcinoma is an exaggeration of its less predictable behavior. The tumor may be considered potentially malignant because of its relatively aggressive behavior but by no means a frank carcinoma in all instances.

It is conceivable that muco-epidermoid tumors of the oral cavity may originate from the epithelium of the mucous membrane. Since the squamous epithelium and the mucous glands both develop from the primordial oral epithelium, the former may also be capable of giving rise to mucous goblet cells. However, there was no such evidence of its origin from the epithelium in this case. Furthermore, the presence of mucous glands in close proximity to the tumor may, on the other hand, justify its origin from the ductal epithelium of ectopic salivary glands.

From the School of Dentistry, University of Minnesota.

*At present, professor and chairman, department of pathology, University of Pittsburgh School of Dentistry.

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■ THE SCIENTIST

The complexity of the scientist's nature must account for his being considered mildly interesting and colorful. He is thought to be very valuable to society and to derive very great personal satisfaction from his work. If one were to study his recreational habits one would find him most frequently at chess, rarely playing bridge, and never playing poker.

In summary, there emerges a picture of the scientist as a highly intelligent individual devoted to his studies and research at the expense of interest in art, friends, and even family. The scientist derives great personal satisfaction, a sense of success, reasonably high status in the community, and a modest income from his work. He serves mankind in a selfless way, almost unaware that he is doing so; he serves others by serving himself.—*David C. Beardslee and Donald D. O'Dowd. The College-Student Image of the Scientist. Science 133:998 March 31, 1961.*

Scrofuloderma: *report of case*

■ *Donald D. Doughty,* D.D.S., and W. Darby Glenn,† M.D., Coral Gables, Fla.*

The diagnosis of swellings located in the region of the submaxillary triangle is of considerable interest to both the dentist and the physician. In making a differential diagnosis, sialolithiasis, cellulitis secondary to dental caries, mumps, tubercular lymphadenitis, carcinoma and actinomycosis must be considered. The following case is reported to illustrate the role of the sialogram in diagnosis of swellings of the submaxillary triangle. Tuberculous infection may enter the body through a carious tooth and become established in the bone or invade soft tissues by way of the lymphatics.[1]

REPORT OF CASE—A 14 year old white boy, with a swelling of the right side of the neck of approximately three weeks' duration, was seen on June 24, 1960 for consultation by the oral surgery service. The swelling was nonpainful and increased in size during the day. His parent stated that when the child was about 4, he had had a swelling and that even though this decreased, nodularity persisted for years. The boy had had a previous diagnosis of atrial septal defect that remained asymptomatic and had not been treated. He had two sisters, aged 15 and 25 years, who had been treated by artificial pneumothorax for extensive tuberculosis.

CLINICAL EXAMINATION—The neck showed a unilateral swelling that was hard, nodular and located over the site of the right submaxillary gland (Fig. 1, left). There was enlargement of regional lymph nodes. The swelling was warm to the touch and tender to palpation. Intraoral examination revealed the tonsils were enlarged and teeth were missing.

LABORATORY DATA—Laboratory examination on June 25, 1960 showed the complete blood count and urinalysis were within normal limits. On July 1, the examination showed alkaline phosphatase, 8.4 mg. per 100 ml. (normal, 2-4 mg. per 100 ml.). On July 2, serum calcium was 10.3 mg. per 100 ml., serum phosphorus, 6.0 mg. per 100 ml.; urine phosphorus and calcium were within normal limits.

ROENTGENOGRAPHIC EXAMINATION — An intraoral view revealed multiple calcified areas extending into the cervical lymph nodes (Fig. 1, right). The patient was seated in the x-ray room where the following units of equipment were available on a stand: one 20 cc. syringe containing prewarmed Lipiodol, adhesive tape, needle holder with no. 0000 black silk suture and cutting edge needle, and a loaded ampule syringe. Bilateral mandibular block was carried out with lidocaine with epinephrine 1:100,000. The caruncle of Wharton's duct was located and dilated with a polyethylene probe (Fig. 2, left). A single no. 0000 black silk suture was passed around Wharton's duct, after which a 19 gauge blunt needle was inserted in the duct and the ligature tied to hold it in place. Three cubic centimeters of prewarmed Lipiodol was then injected into the duct; the syringe was secured with tape to prevent back flow of Lipiodol, and a lateral jaw roentgenogram was made. The submaxillary gland and its ducts were clearly outlined and were not involved (Fig. 2, right).

CULTURE AND BIOPSY—On June 30, extraoral incision and drainage were instituted by

Fig. 1—Left: View showing unilateral swelling over site of right submaxillary gland. Right: Intraoral view

Fig. 2—Left: Caruncle of Wharton's duct which has been dilated with polyethylene probe. Right: View reveals that submaxillary gland and its ducts are not involved

the ear, nose and throat service. A culture was made and biopsy taken. Necrotic tissue was removed and palpation revealed that the submaxillary gland was not involved. An iodoform gauze drain was placed in the wound.

The bacteriologic report indicated the concentrated smear of the drainage, June 30, was positive for acid-fast organisms. The biopsy revealed neutrophilic, lymphocytic and fibrotic infiltration of the area with hemor-

rhage, necrosis and epitheloid proliferation.

In the tissue from the cervical abscess, necrotic tuberculoid granulomatous inflammation, consistent with tuberculosis, was found, notwithstanding negative acid-fast stain in paraffin sections. The diagnosis was tuberculosis of cervical lymph nodes.

CLINICAL COURSE—On July 1, the patient was transferred to the chest service. Examination did not reveal pulmonary extension of the disease. On July 2, the drains were removed from the neck and the wound was granulating. Medical consultation revealed no symptoms of a cardiac condition and the patient was discharged and placed on isoniazid and para-aminosalicylic acid. He was to be followed monthly by both the ear, nose and throat and chest services.

DISCUSSION—This lesion was a firm, well-defined swelling that was "pointing" on the skin of the left side of the neck. Such a swelling would be suggestive of periapical abscess, sialolithiasis, suppurative parotitis or tubercular adenitis. In an attempt to rule out dental infection, periapical roentgenograms and a lateral jaw film were taken. Calcific deposits were revealed in the submaxillary gland. To localize the calcific deposits, a sialogram was obtained. The gland was now thoroughly outlined and it was noted that the calcific deposits were located in the soft tissue and were extraglandular, suggestive of lymph nodes. The teeth present in the mouth were not involved. However, missing permanent teeth could have been an earlier portal of entrance for the tubercle bacilli.[2] The palatine tonsils are a known portal of entry for the tubercle bacilli, but if this had been true in this instance, the nodes of the deep jugular chain would have been involved.[3]

The skin over this swelling would have been eroded through in a short time, and there was firmness of the cervical nodes known to be consistent with tubercular adenitis.[4] The known fact that the acid-fast organisms are difficult to demonstrate in such lesions was noted in this case.[5] Repeated smears of the acid-fast organisms were isolated and a diagnosis of tuberculosis established.—3299 *Ponce de Leon Boulevard.*

*Formerly, resident, department of oral surgery, Jackson Memorial Hospital, Miami, Fla.

†Assistant resident, department of otolaryngology, Jackson Memorial Hospital, Miami, Fla.

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Subcutaneous and mediastinal emphysema after oral surgery: *report of case*

■ *Herbert Z. Kleinman,* D.M.D., Danville, Ill.*

Mediastinal emphysema after oral surgery is a rare medical entity. A reference in Thoma[1] states that only nine cases were recorded between 1900 and 1946. More recently Friedman[2] and Weatherly[3] have reported occurrences of this nature. The exact way that air enters the tissues is not fully understood; however, it is believed that a sudden elevation in intrathoracic pressure might produce a rupture of an alveolus in the hilum of a lung, allowing air to escape upward. There is also the supposition that air may be forced down between loose oral tissue to become trapped in the subcutaneous spaces. In the case reported here, a possibility exists of such a combination of events taking place.

REPORT OF CASE—A white 37 year old man with a medical diagnosis of schizophrenia, but in fair mental contact, had the right lower third molar removed surgically. A flap was reflected to obtain access to the roots. The tissues were sutured and postoperative hemorrhage controlled by a gauze pack. Three hours after the extraction, the patient was seen by the medical officer of the day who observed a considerable swelling of the face, neck, and upper thoracic region. The patient stated that onset of the condition was 15 minutes prior to his seeing the physician.

Examination revealed that the swollen regions of the face, neck and thorax gave rise to a bubbling sensation on palpation. The patient had a slight elevation of temperature and other than a feeling of fullness there was no discomfort. Further observation disclosed that the patient coughed continually with his mouth tightly closed. Roentgenograms of the neck and thorax revealed air in the subcutaneous tissues and mediastinal space without the presence of a pneumothorax. Prophylactic antibiotics and bed rest were prescribed. Within four days the swelling had subsided completely and an uneventful recovery was made.

From the clinical and roentgenographic observations, it was the impression that air had been released into the tissues from two sources. The patient coughing with his mouth closed set up a pumping action which forced air down between the incised tissue and the periosteum and a rupture of a lung alveolus allowed air to escape into the mediastinum.

SUMMARY—A patient was seen in whom subcutaneous and mediastinal emphysema developed after oral surgery. Although this condition occurs infrequently, it is encumbent on the dentist and the physician to recognize its presence and realize in most instances that conservative treatment will result in uneventful recovery.

*Chief, dental service, Veterans Administration Hospital.

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In memoriam:

THOSE OF US who have had the opportunity to know Joseph E. Schaefer realize that oral surgery has lost a great teacher. Many of our profession who received instruction at Chicago's Cook County Hospital will recall vividly the hours spent with Dr. Schaefer. Wherever oral surgeons gather today, stories of past personal experiences with Dr. Schaefer at Cook County Hospital are recalled.

He was born in Muscatine, Iowa, July 3, 1885 and obtained his preliminary education in the St. Mary's parochial school. He entered the Chicago College of Dental Surgery in 1905 and received his D.D.S. in 1907. Being a continual student, Dr. Schaefer entered the Chicago Kent College of Law in 1911 and received his LL.B. in 1915. Early in his career he became interested in teaching and was appointed professor and head of the department of dental jurisprudence and associate professor of prosthetic dentistry at the Chicago College of Dental Surgery. Many of his early articles in 1912 and 1913 dealt with the articulator and the occlusion of teeth.

In the first World War Dr. Schaefer served in the Dental Corps for two years. In 1919 he continued his education and received his B.S. degree from Lewis Institute. During the following years he studied medicine and in 1923 was awarded the degree of Doctor of Medicine from Rush Medical School. It was about this time that Dr. Schaefer became interested in plastic surgery and studied under Dr. V. P. Blair of St. Louis.

In 1926 Dr. Schaefer joined the staff of Northwestern Dental School and for a period of almost 30 years he taught oral surgery to undergraduate and graduate students alike. He rose to the rank of professor and was chief of the oral surgery section at Cook County Hospital for many years. It was at this hospital that he held postgraduate courses which attracted students from many parts of the world.

Joseph E. Schaefer, D.D.S., LL.B., M.D.

1885-1961

Dr. Schaefer at various times served as librarian of the Chicago Dental Society, First Supreme Vice President of the Xi Psi Phi dental fraternity and president of the Chicago alumni of the Xi Psi Phi fraternity. He was president of the Chicago Dental Society in 1933-1934, diplomate of the American Board of Oral Surgery, and for many years served as an examiner on the Board. He also served in the Medical Corps for three years during World War II and was attached to the Michael Reese Hospital unit. During his lifetime he contributed, as both author and co-author, over 40 articles to various dental publications. Until the time of his death he was associated with Ralph Rudder of Chicago. During the last years of his life he was greatly interested in art and the construction of jewelry. He passed away on June 29, 1961 at his residence of the last 15 years, the Illinois Athletic Club.

Perhaps his most outstanding quality as a teacher was his ability to get his students to think. Dr. Schaefer would never accept the answer "I don't know" but by his continual questioning allowed the students to arrive at the correct solution to the problem presented. Oral surgery owes a great debt to a man who could have gone in so many other directions but instead chose to devote so much of his life to the teaching of oral surgery to dentists.—*Donald H. Devlin.*

■ TEXTBOOK OF PHYSIOLOGY. By W. W. Tuttle, Ph.D., Sc.D., and Byron A. Schottelius, Ph.D. Fourteenth edition. 547 pages with 313 illustrations and 5 color plates. Index. $7. St. Louis, C. V. Mosby Company, 1961.

A forty-five year survival of a textbook is rather unusual. The first edition of this book edited by Dr. William D. Zoethout was published in 1916. The last one he edited was in 1958. The success of a book may be gauged in general by the number of editions. The appearance of a new edition is in itself evidence of the value of a new publication. With the death of Dr. Zoethout, the responsibility for the fourteenth edition of this book has been undertaken by Drs. Tuttle and Schottelius, two eminent physiologists.

This edition is a real revision of the previous edition, bringing into one volume an outstanding presentation of physiology to date, with conciseness and clarity. In this edition the authors include most modern concepts of human physiology. The chapters on muscle and nerve have been rewritten. Much new material has been included, and old material has been deleted. Many new tables have been added, including those dealing with blood pressure, nutrition and body weight. The new concept of ideal weight is presented. Numerous old figures have been redrawn and new ones added, including one showing heart catheterization. The text material has been reorganized in a more logical sequence to facilitate its teaching and understanding. The illustrations are carefully chosen and nicely reproduced. There is a thorough index and a glossary is also appended.

This is an excellent basic textbook of physiology for medical and dental students. It also serves as a reliable current reference work for physicians and dentists. The book should be available in every medical and dental library. This volume is well printed, well illustrated and attractively bound.—*E. Alan Lieban.*

■ MODERN DRUG ENCYCLOPEDIA AND THERAPEUTIC INDEX. Edited by Harry D. Fein. Eighth edition. 1,658 pages. Index. $17.50. New York, Reuben H. Donnelley Corp., 1961.

This useful reference book is revised on a three-year schedule. Monthly supplements, sent free of charge to those who buy the book, supply information about drugs which appear on the market between revisions.

The descriptive monographs which constitute the bulk of the text contain generic names, structural formulas, quantitative statements of composition in the case of mixtures, brief statements of actions, uses and precautions, dosage information, and a list of the available dosage forms and package sizes. This kind of source material can save the busy practitioner much time.

Drugs are described because they are available; no recommendation or assurance of usefulness or superiority is implied in the listing. The information in the monographs is supplied by the firms who distribute the products.

The indexing for the new edition has been improved. There is a therapeutic index, a manufacturers' index and a general index. The reader should have no difficulty in finding the item he is looking for if it is listed.

The physical qualities, such as printing, paper and binding, are good.—*Donald A. Wallace.*

Announcements

■ McKelvey Leaves Army to Become Dean of Puerto Rico School

Col. Lowell E. McKelvey, chief of oral surgery at Brooke General Hospital, Fort Sam Houston, Texas, retired from active duty with the U. S. Army Medical Service, July 31, to become dean of the University of Puerto Rico School of Dentistry and professor of oral surgery. Colonel McKelvey is a graduate of Ohio State University and its school of dentistry. He also has a Master of Science degree in oral surgery from the University of Michigan School of Dentistry. He has served on the examination committee of the American Society of Oral Surgeons and is a Fellow of the American College of Dentists, a diplomate of the American Board of Oral Surgery, and a member of the Board of Oral Surgery Examiners.

■ Conference on Graduate Education in Oral Surgery Set for November

The American Society of Oral Surgeons will conduct its fourth conference on Graduate Education in Oral Surgery, November 27, at the headquarters of the American Hospital Association, Chicago.

■ Institute on Hospital Dental Service Planned for November

The American Dental Association and the American Hospital Association will conduct an advanced institute on hospital dental service, November 28-30, at the latter's headquarters in Chicago. Registration fee is $45. Topics to be discussed include expansion of the established dental service, development of hospital dentistry for the general dentist, the dental service as a diagnostic service to the hospital and the extension of hospital dental service to special patients. Economic factors to be considered in the operation of a dental service will be the subject of a panel discussion.

■ Oral Pathology Program Offered at University of Oregon

A graduate program in oral pathology is being offered at the University of Oregon Dental School. It is a three-year program, the first year of which consists of resident-type training in general pathology at the University of Oregon Medical School. The following two years are taken under the direction of Norman H. Rickles and Robert J. Bruckner at the dental school. A special research

activity leading to a thesis completes the requirements for the Master of Science degree in oral pathology. Financial support is available through the Teacher-Training Program of the U. S. Public Health Service, and a stipend will vary from $4,000 to $5,000 per year depending on individual circumstances. Inquiries should be addressed to Ellis B. Jump, chairman, Graduate Committee, University of Oregon Dental School, 611 S.W. Campus Drive, Portland 1.

■ University of Illinois College of Dentistry Offers Courses

The University of Illinois College of Dentistry is accepting applications for two- and three-year full-time courses in oral surgery beginning July 1962. Both programs carry credit toward a Master of Science degree. Further information may be obtained from Daniel M. Laskin, department of oral and maxillofacial surgery, University of Illinois, 808 S. Wood St., Chicago 12.

■ Albert Einstein College of Medicine Offers Courses

The Albert Einstein College of Medicine will sponsor courses in anesthesiology, endodontics, oral pathology, oral surgery, orthodontics, periodontics, pharmacology, clinical photography, and prosthetics during the academic year 1961-1962. All courses are designed to be integrated into the general dental practice. Further information may be obtained from the director, postgraduate dental program, Albert Einstein College of Medicine, Eastchester Rd. and Morris Park Ave., Bronx 61, N.Y.

■ Internship Available at Baltimore Children's Hospital

The Children's Hospital of Baltimore is accepting applications for a full-time internship to begin July 1, 1962. The internship is of the rotating variety and will stress dentistry for the handicapped and the use of general anesthesia in complete dental service. The training will be given with the cooperation of the department of pediatrics of the Johns Hopkins Hospital. Further information may be obtained from Mr. C. Christiansen, administrator of the hospital, 3825 Greenspring Ave., Baltimore 11.

■ Oral Surgery and Hospital Management Courses at Ohio State

Postgraduate courses in oral surgery and hospital management for dental procedures will be available at Ohio State University. The oral surgery course will be given by Morgan L. Allison, November 27-29, 1961, and again May 7-9, 1962. The fee is $75. The hospital management course will be given by Morgan L. Allison and Bernard S. Snyder, January 22-24, 1962. The fee is $100. Further information may be obtained from the College of Dentistry, Postgraduate Division, Ohio State University, Columbus 10.

■ Rowe Smith Annual Seminar on Carbohydrate Metabolism

The Rowe Smith Memorial Foundation will hold its eighth annual seminar on disturbed carbohydrate metabolism, November 30 - December 3, at the Fly-N-Fish Lodge, Karnack, Texas. Essayists will be E. Cheraskin and Donald W. Seldin, M.D. Moderator will be D. Walter Cohen. The registration fee of $185 includes room, meals and tuition. Further information may be obtained from the Rowe Smith Memorial Foundation, Inc., 501 State National Bank Bldg., Texarkana, Ark.-Texas.

■ Research and Teaching Traineeships at University of Pennsylvania

Research and teaching traineeships in the basic sciences, in periodontology and in the comprehensive treatment and rehabilitation of the cleft palate patient are available at the School of Dentistry, University of Pennsylvania. All traineeships are supported by the U. S. Public Health Service. Annual stipends vary from $4,500 and up depending on the qualifications and needs of the successful candidates.

Inquiries for the basic science and cleft palate traineeships should be sent to the chairman, Committee on Traineeships and Fellowships, University of Pennsylvania, School of Dentistry, 4001 Spruce St., Philadelphia 4. Inquiries for traineeships in periodontology should be sent to the dean, Graduate School of Medicine, 237 Medical Laboratories, University of Pennsylvania, Philadelphia 4.

■ International Oral Surgery Meeting in London, 1962

The first international conference on oral surgery, sponsored by the American Society of Oral Surgeons and the Royal College of Surgeons of England, will be held at the Royal College in London, July 1-4, 1962. All interested dentists and physicians are invited to attend.

The program will include symposiums on the temporomandibular joint and on maxillofacial injuries in addition to a wide variety of scientific papers and discussions. Approximately one half of these papers will be presented by essayists from North, South and Central America, and the other half from the United Kingdom, Europe, Africa, and Asia. Visitors attending the conference also will have an opportunity to observe surgical procedures in the hospitals of London.

Extensive social and ladies programs have been arranged. Features will include a banquet at London's Guildhall and a reception by Her Majesty's Government. Additional details and a bulletin may be obtained from Mr. D. C. Trexler, American Society of Oral Surgeons, 840 N. Lake Shore Drive, Chicago.

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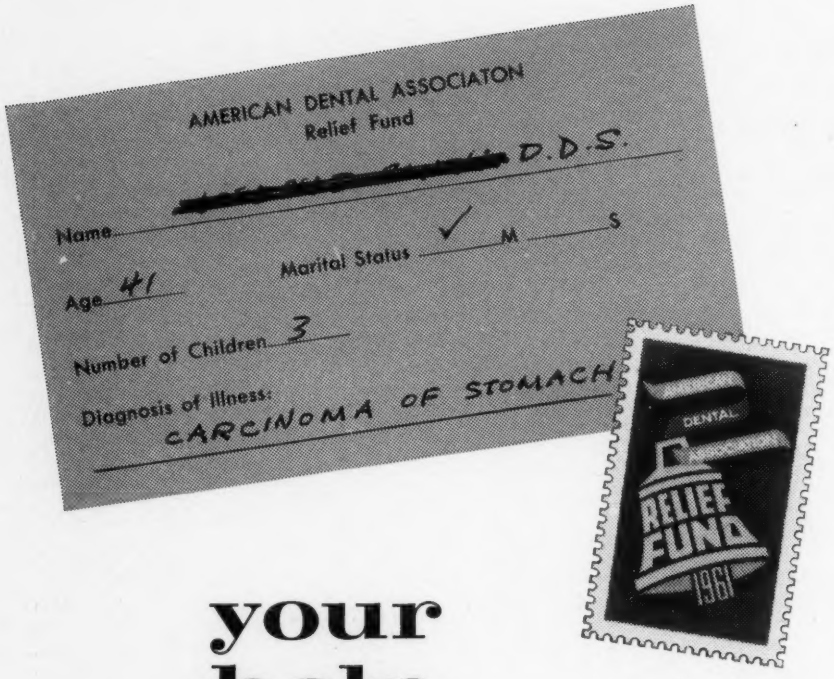

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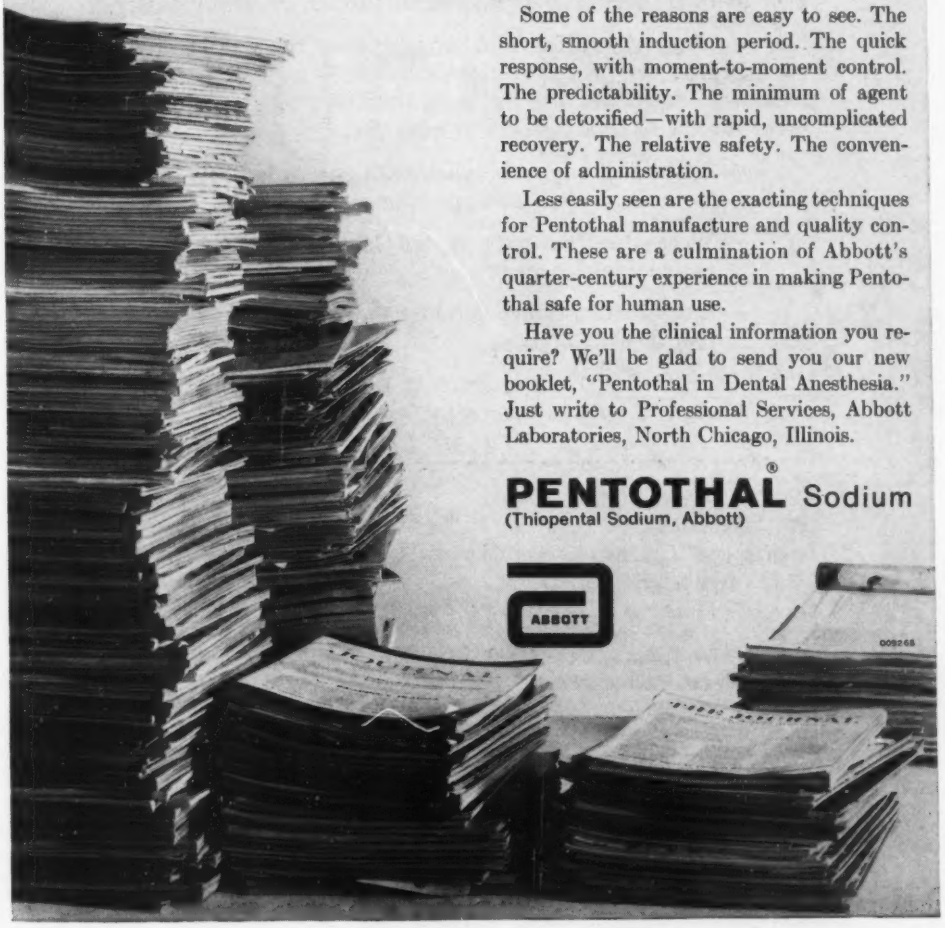

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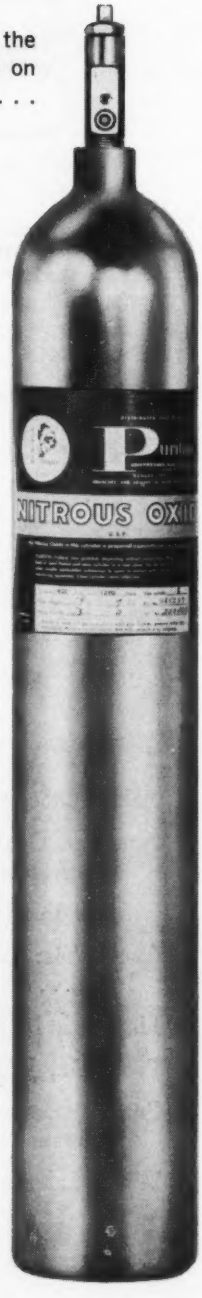

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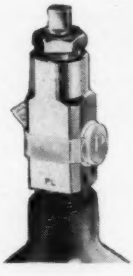

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